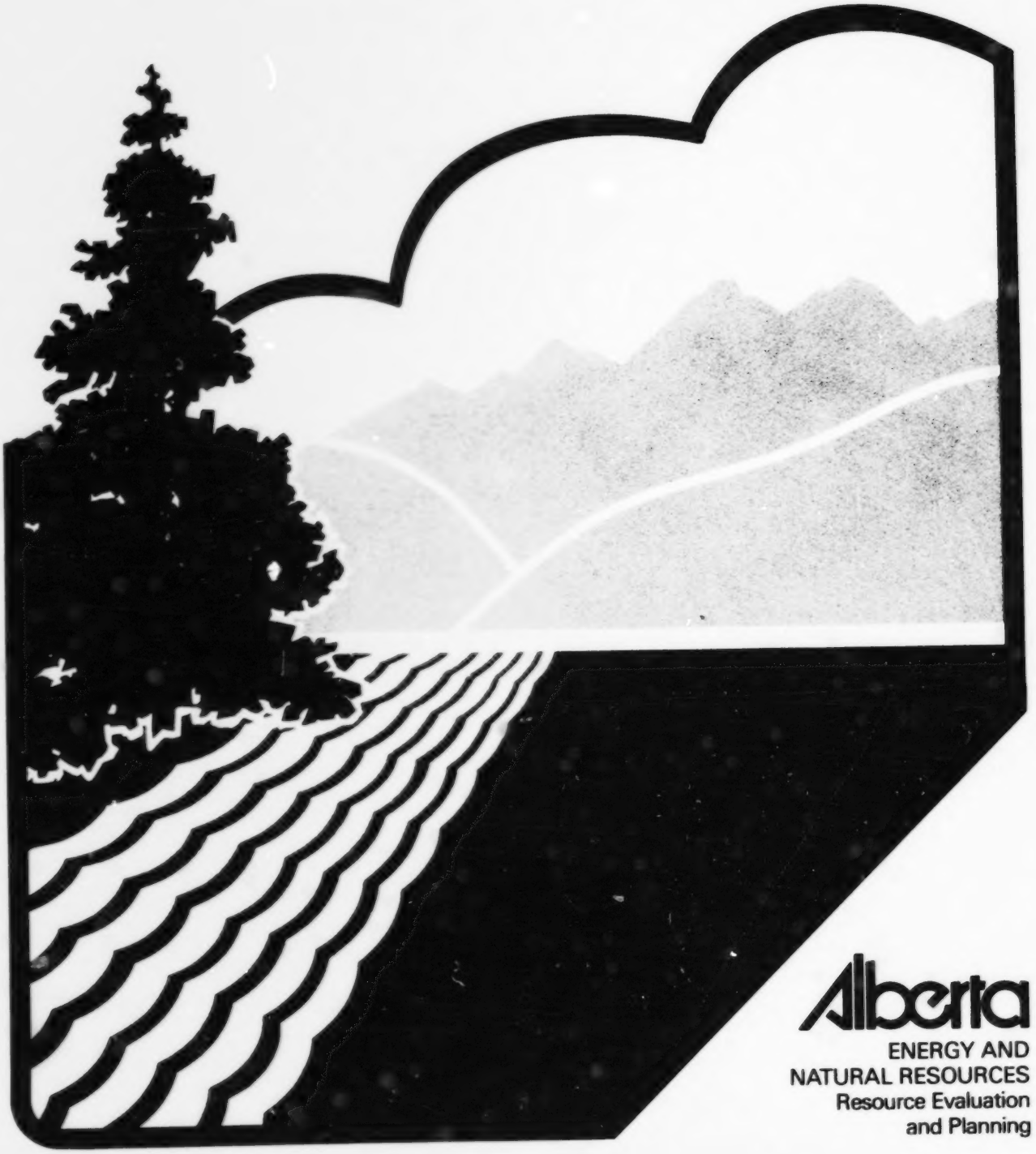
Integrated Resource Inventory

Physical Land Classification of the Rocky-North Saskatchewan Area



Alberta
ENERGY AND
NATURAL RESOURCES
Resource Evaluation
and Planning

PHYSICAL LAND CLASSIFICATION OF THE ROCKY NORTH SASKATCHEWAN AREA

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Resource Inventory and Appraisal
Resource Evaluation and Planning

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ABSTRACT

The Physical Land Classification of the Rocky-North Saskatchewan area provides data on the geology, geomorphology, landforms and soils of the area and indicates their distribution and extent. The detail of the present landscape is considered to be the result of complex folding and faulting of the formations underlying the area and the modifications caused by glacial and post-glacial processes.

The study area lies mainly within the Western Alberta Plains of the Interior Plains Region and includes some portion of the Rocky Mountain Foothills of Western Cordillera Region (Bostock, 1970). The eastern front of the foothills is well marked and coincides with the first zone of faulting and folding west of the interior plains.

The physiographic regions of the area include the Rocky Mountain Foothills and the Western Alberta Plains. There are several physiographic subregions recognized on the basis of differing patterns of relief, geology and geomorphology. These include the Shunda Benchland, the O'Chiese and Buck Lake Uplands, and the Brazeau and Crimson Lake Plains. Further subdivision of the physiographic subregions into geomorphic systems and units has been provided to indicate different segments of the landscape that have distinct patterns of landform, parent material, soil, texture and drainage.

The area was glaciated by a number of ice sheets during the Pleistocene Epoch. Parent geological material in most areas consists of glacial deposits. In local areas, weathered bedrock, eolian, alluvium and organic materials can be found.

The predominant soils in the Rocky-North Saskatchewan area are Eluviated Eutric Brunisols, Brunisolic Gray Luvisols and, to a lesser extent, Orthic Gray Luvisols. Soils developed on coarse-textured materials have Eluviated Dystric Brunisol or Orthic

Regosol morphology. Poorly drained soils are either Orthic or Humic Gleysols. Organic soils, usually Mesisols, occur in very poorly drained areas where the water table is at or near the surface throughout the year.

The study area is covered with coniferous and mixedwood forests. Dominant tree species are lodgepole pine, white spruce and, to a lesser extent, aspen and balsam poplar. In low lying areas, black spruce, dwarf birch and tamarack are common.

The climate of the area is characterized by moderately warm summers and relatively cold winters. The mean summer temperature (May to September inclusive) at Rocky Mountain House is 10^{o}C and decreases with the increase in elevation westwards. The annual precipitation varies from 500 to 550 millimetres and increases from east to west.

PREFACE

The physical land classifiction of the Rocky-North Saskatchewan area was initiated in 1980 as part of the continuing program by the Land Classification Section to meet the needs and requirements of resource planning and management agencies within the department, and other interested government and research groups.

The purpose of this report and accompanying physical land classification maps is to provide data on the characteristics, location, and areal distribution of the physiographic regions, subregions, geomorphic systems and geomorphic units of the Rocky-North Saskatchewan area.

The report provides background information on physiography, bedrock geology and Quaternary history of the area. This is followed by discussions on landforms and surficial deposits and their relationships to geomorphic systems.

In the report, physiographic subregions are described in detail. Each physiographic subregion is characterized in terms of its definite patterns of relief, geology and geomorphology. Genetic materials and landforms depict associated geomprohic systems which are broken down into relatively homogeneous units of the landscape.

The physical land classification maps (83 B/2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16; 83 C/8, 9, 16; 83 G/2, 3) at a scale of 1:50 000 show the location and extent of the individual geomorphic units as well as other levels of delineations. A general map at a scale of 1:250 000 indicating the type of distribution of the geomorphic systems accompanies this report. The geomorphic units are identified on the map by symbols. For a complete understanding of the map symbols, the detailed legend on the map should be consulted.

It is important to realize that the basic purpose of this study is to provide information for broad or regional levels of resource planning and management. For detailed on-site planning and management, on-site examination is necessary.

ACKNOWLEDGEMENTS

The physical land classifiction of the Rocky-North Saskatchewan area was conducted by the Land Classification Section, Resource Evaluation and Planning Division of Alberta Energy and Natural Resources.

Grateful acknowledgement is made to the staff of the Land Classification Section who contributed through discussion and constructive criticism; Cartographic Services, Resource Evaluation and Planning Division, for drafting the maps and illustrations in this report and George Philippides, Cartographic Services for preparing the block-diagram sketches.

1. INTRODUCTION

1.1 Location And Extent

The Rocky-North Saskatchewan study area covers about 6 950 km^2 (2 680 mi^2) in west central Alberta (Figure 1). The area lies between 114°17' and 116°18' west longitude and between 52°05' and 53°15' north latitude and includes all or parts of Townships 36 to 49, Ranges 3 to 16, West of the Fifth Meridian. It includes R1, R2, R5 and R7 Managements Units as well as a small portion of the R9 Management Unit, and the R01 area which is predominantly public land adjacent to the Rocky-Clearwater Forest.

1.2 Physiography

The Rocky-North Saskatchewan area lies mainly within the Western Alberta Plains including a small portion of the Rocky Mountain Foothills. The altitude in the northeastern part of the area is about 800 m and increases gradually to about 2 180 m in the Rocky Mountain Foothills.

All prominent topographic features in the area are related to the structure and lithology of the underlying bedrock and their differential resistance to erosion. In the Rocky Mountains Foothills region, the south western section of the study, the formations consist of closely-folded, northwest to southeast - trending older rocks which form high, parallel ridges (Erdman, 1950). The Brazeau Range anticline with an elevation of 2 180 m trends diagonally across the southwestern margin of the area and represents one of the outlier ranges in the outer Foothills.

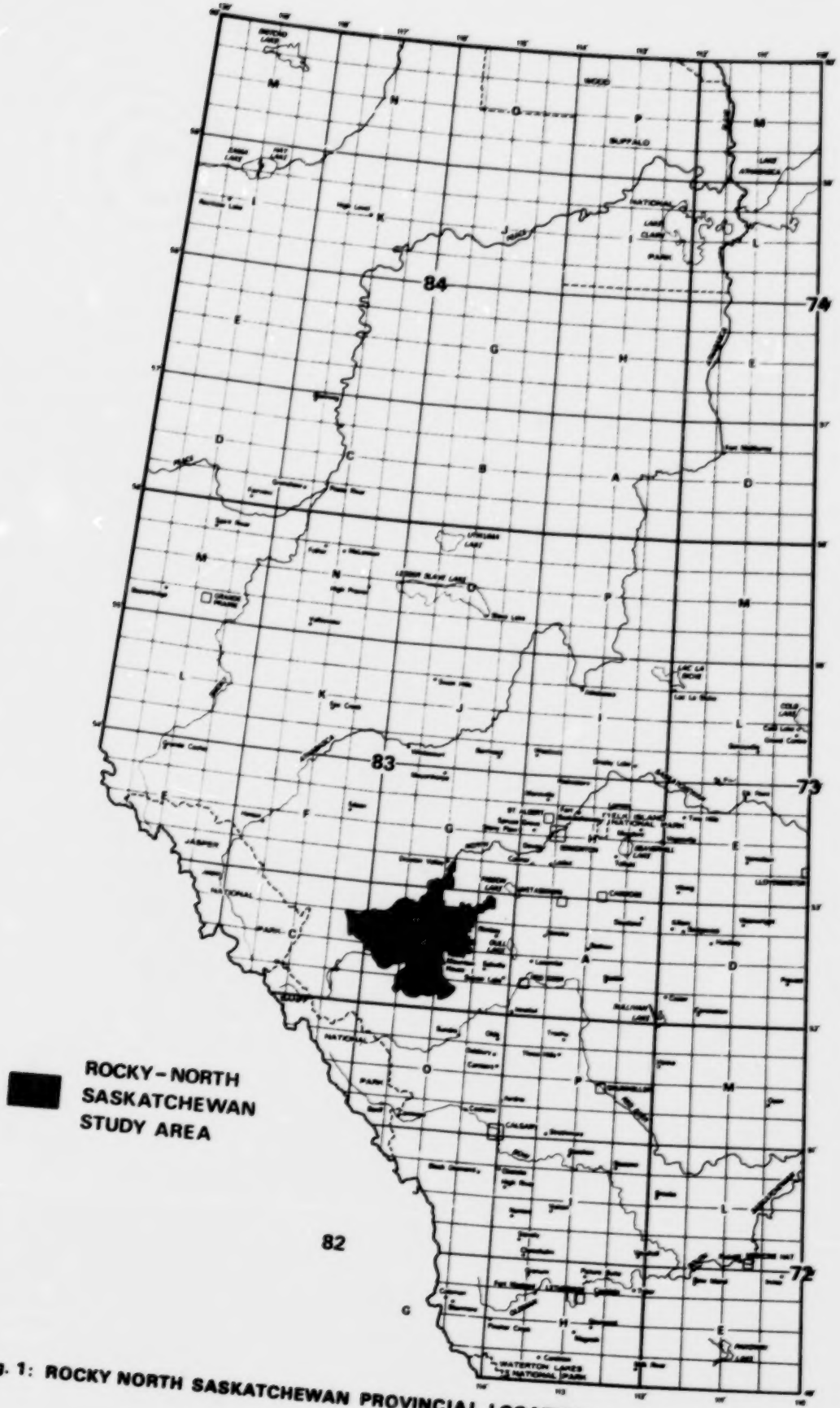

Fig. 1: ROCKY NORTH SASKATCHEWAN PROVINCIAL LOCATION

The Plains region, with an elevation of up to 1 525m, is extremely variable in topography and appears to have resulted from extensive erosion of the soft, Upper Cretaceous and Paleocene rocks, modified later by glaciation and post glacial activity. Much of it is underlain by low-dipping rocks, though moderate to high dips occur locally (Erdman, 1950).

1.3 Bedrock Geology

The Plains region of the Rocky-North Saskatchewan area is underlain by Paleocene rocks, largely of the Paskapoo Formation (Green, 1972). This formation consists of thick-bedded, calcareous sandstones, siltstones and mudstones. It also includes minor conglomerate, thin limestone and coal beds. The strata within the Plains dip to the southwest at shallow angles which increases steadily toward the Foothills.

The Foothills are entirely of sedimentary origin and dominated by the formations which have been folded and thrust-faulted by mountain building processes. The formations, mainly of Cretaceous age, are generally southwest dipping. The Brazeau Formation, which is the most common bedrock in the Foothills, consists of nonmarine, thick-bedded, chloritic and feldspathic sandstones, and blocky gray mudstones.

1.4 Quaternary History

The surficial deposits and landforms of the Rocky-North Saskatchewan area were produced primarily by the major Wisconsin advance of cordilleran and contintal glaciers. The land surface left by the regional ice-cover has been subsequently modified by alpine glaciation and stream action to produce the present landforms. Glaciation appears to have served primarily to widen, presumably, former V-shaped valleys into U-shaped ones, and to produce a variety of glacial landforms.

The southwestern part of the study area was apparently covered by a cordilleran ice-sheet from the Rocky Mountains during the late Wisconsin - 40 000 to 10 000 years ago. The minimum thickness of the ice-sheet, as indicated by the presence of glacially-transported erratics on the Brazeau Range, was approximately 2 100 m (Erdman, 1950). This ice-sheet was probably part of the ice-fields and glaciers that covered most of the mountainous region of the Western Canada during the Pleistocene Epoch.

In the north east, the last major Laurentide ice-sheet advanced from the north between 25 000 and 14 000 years ago (Harris et al, 1972). The Laurentide ice mass covered most of the area to the northeast and impounded proglacial lakes against the mountain front (Boydell, 1978). The Brazeau plain and the Crimson Lake plain are essentially glaciolacustrine basins which probably formed as a result of this ponding.

Postglacial erosion, transportation and deposition have also influenced the landscape of the Rocky-North Saskatchewan area. In the valleys where new courses have been established, the streams have become incised into glaciolacustrine and morainal plains and a number of terraces have developed. Fluvial materials, eolian and organic deposits and their associated landforms are the result of postglacial activities in the area.

Boydell (1978) provides a surficial geology map at a scale of 1:250 000 and a detailed discussion of glacial events for the south part of the area.

1.5 Surficial Deposits and Landforms

The major surficial deposits found in the area are morainal (till), glaciolacustrine and, glaciofluvial. Post glacial materials, such as fluvial, eolian, and organic are of minor occurrances.

Till is an unsorted, unstratified glacial deposit and in the study area covers most of the Shunda Benchland, O'Chiese and Buck Lake Uplands, and the lower slopes of the Foothills. The dominant

landform associated with the till deposits is ground moraine. A large hummocky moraine area with knob and kettle topography is found on the Buck Lake Upland. On the Shunda Benchland there are areas of ridged and fluted till deposits which were probably formed by the plastic flow of material at the base of the glacier. These ridges and flutings trend in a southeasterly direction indicating the direction of local ice lobe movement. Some areas of ground moraine are strongly influenced by the topography of the underlying bedrock, and are considered to be bedrock controlled.

Glaciolacustrine sediments were deposited in the proglacial lakes which resulted from the blocking of glacial meltwater flow to the east by the retreating continental glacier. The main glaciolacustrine deposits are found in the Brazeau and Crimson Lake Plains adjacent to the North Saskatchewan, Clearwater and Nordegg Rivers. The surface form of the landscape is usually undulating with fairly long, gently slopes.

Glaciofluvial materials are sediments deposited by glacial meltwaters. Major outwash gravel and sand deposits are found along the North Saskatchewan and Baptiste Rivers and some creeks. Two pitted glaciofluvial areas are present adjacent to the Baptiste River on the O'Chiese Upland. In the central part of the North Saskatchewan Valley, small localized outwash deposits are found at the former townsite of Saunders. South of the North Saskatchewan River, in the Trout Creek area, a series of linear gravel ridges trending to the east and southeast form an esker complex. Several other creeks in the Shunda Benchland area such as Meadows Creek and Rough Creek contain extensive gravel deposits.

Recent fluvial deposits are found in the valley bottoms adjacent to creeks and streams where frequent flooding has occurred. Terraces of sand, silt, and gravel are numerous along the Clearwater, North Saskatchewan and Nordegg Rivers.

Wind erosion and deposition occurred in the relatively long dry period following ice recession. Eolian deposits occupy extensive areas on the Brazeau Plain and the Crimson Lake Plain.

Small areas of windblown sand are found along the Nordegg River, and along some of the creeks in the O'Chiese Upland area. The source of these deposits is of glaciolacustrine origin. Sands deposited on the Crimson Lake Plain have been reworked by winds into U-shaped dunes. These dunes are presently vegetated and stable. In some portions of the Western Alberta Plains region, a silty loess veneer occur over glacial materials. This loess probably originated from the floodplains of the Athabasca River and shores of Brule Lake to the northwest.

Organic deposits are found throughout the Western Alberta Plains region; however, they are most widespread on the Buck Lake Upland, the Brazeau Plain and the Crimson Lake Plain. They occur in depressional and level landscape positions where surface waters accumulate. These soils are developed and maintained under the influence of permanent groundwater discharge which in some areas manifests itself in the form of seepage. The Organic soils are associated with the hydrophytic vegetation which in the study area includes black spruce, tamarack, feather-moss, sphagnum moss and sedge.

Drainage

The area is drained by the Nordegg, Baptiste, North Saskatchewan and Clearwater rivers and their many tributaries which are part of the North Saskatchewan River Drainage system. The North Saskatchewan river enters the area from the west and cuts across the Brazeau Range and the Shunda Benchland. It flows eastward, makes an abrupt turn northward, passing through Rocky Mountain House and continues flowing north out of the study area.

2. METHODOLOGY

The Physical Land Classification Methodology (Land Classification Section, 1978) provides guidelines for the systematic delineation of land areas based on the principle of recognizing the geomorphic nature of the earth's surface along with an understanding of structure, genesis and process as reflected in the land-forms, parent material, soils and topography.

The classification includes four categories or hierarchical levels (Table 1). The broadest of these categories, the physiographic region, is defined on the basis of elevation, relief and structural geologic formations. Category 2, the physiographic subregion, is a subdivision of the physiographic region with defined patterns of relief, geology and geomorphology. The geomorphic system, category 3, represents the component parts of a subregion with recurring patterns of landforms, as defined and distinguished by mode of origin (Genesis), composition surface expression. Category 4, the geomorphic unit, is a homogeneous area of land in terms of parent material, surface expression, soil texture, slope, aspect and drainage. This is the fundamental unit that can be rated for ecological suitability.

Table 1

LEVELS OF CLASSIFICATION

Classification Level	Delineating Criteria	Scale of Derivation
1. Physiographic Region	Elevation, relief and structural geologic formations	1:1 000 000 to 1:3 000 000
2. Physiographic Subregion	Definite patters of relief, geology and geomorphology	1:500 000 to 1:1 000 000
3. Geomorphic System by Genetic composition	Recurring pattern of landforms distinguished (surficial materials) and Surface Expression.	1:50 000 to 1:250 000
4. Geomorphic unit	Homogeneous areas of land with inherent properties of Genetic Composition (surficial material), Surface Expression, Texture, Slope (type and %), Aspect, Erosional and Depositional Modifiers, Integration of soils (subgroup level - CSSC) and Internal Drainage (CSSC).	1:5000 to 1:50 000

2.1 Interpretation

The physical land classification of the Rocky-North Saskatchewan area was based primarily on systematic aerial photo interpretation augmented by field data and existing inventory and research information.

Initially, small scale maps and aerial photographs were used to delineate the physiographic regions and subregions of the area.

Further separations were then made, on the basis outlined in Table 1, by interpretation of aerial photographs at scale of 1:40 000 and 1:31 680. The results of the systematic aerial photo interpretation were then transferred to topographic maps, at a scale of 1:50 000, and used as a basis in the ensuing field work. The final physical land classification maps of the area are a composite of the information obtained from the aerial photographs, field work conducted in the area, and the data from previous studies.

2.2 Field Procedure

The aerial photo interpretation was verified and supplemented with field work conducted in the summer of 1981. Field plots were chosen to characterize individual geomorphic systems and units, especially those not readily evident from aerial photographs. Wherever possible, soil pits and any other available exposures such as road cuts and river banks were examined to determine the parent material, landform, soil, drainage and slope. The soils in the area were classified according to the Canadian System of Soil Classification (1978) into soil subgroups within the various great groups and orders. The classification of the soils into subgroups was based mainly on the kinds and degrees of soil development and on the sequence of soil horizons and layers in soil profiles. Other soil properties measurable in the field, such as soil texture, color and thickness of horizons, soil structure and consistency, stoniness and soil pH, were recorded.

Much of the area is heavily forested and access is difficult, particularly on steep terrain. In these areas, a helicopter was used for examination of sites.

3. PHYSICAL LAND CLASSIFICATION

The first level of division, the physiographic region, is based on major differences in elevation, relief and structural geologic formation. Each region outlines areas that are topographically alike and within which the genesis of the landforms is understood. The processes of erosion and deposition within these areas are similar (Land Classification Group, 1978). They are distinguishable at a scale of 1:1 000 000 to 1:3 000 000. There are two major physiographic regions defined in the study area (Figure 2):

I. Rocky Mountain Foothills Region
II. Western Alberta Plains Region

The Foothills region covers a small portion of the study area and constitutes geomorphic systems and units only. The Plains region occupies the remainder of the study area and includes five physiographic subregions (Figure 2) named as follows:

II 1. Shunda Benchland Subregion
II 2. O'Chiese Upland Subregion
II 3. Buck Lake Upland Subregion
II 4. Brazeau Plain Subregion
II 5. Crimson Lake Plain Subregion

The third stratification recognized 32 geomorphic systems. These are essentially landform - parent geologic material subdivisions and are described broadly within their respective subregions. The fourth level, geomorphic units, indicates homogeneous areas within the geomorphic systems in terms of parent material, surface expression, soil texture, slope, aspect and drainage.

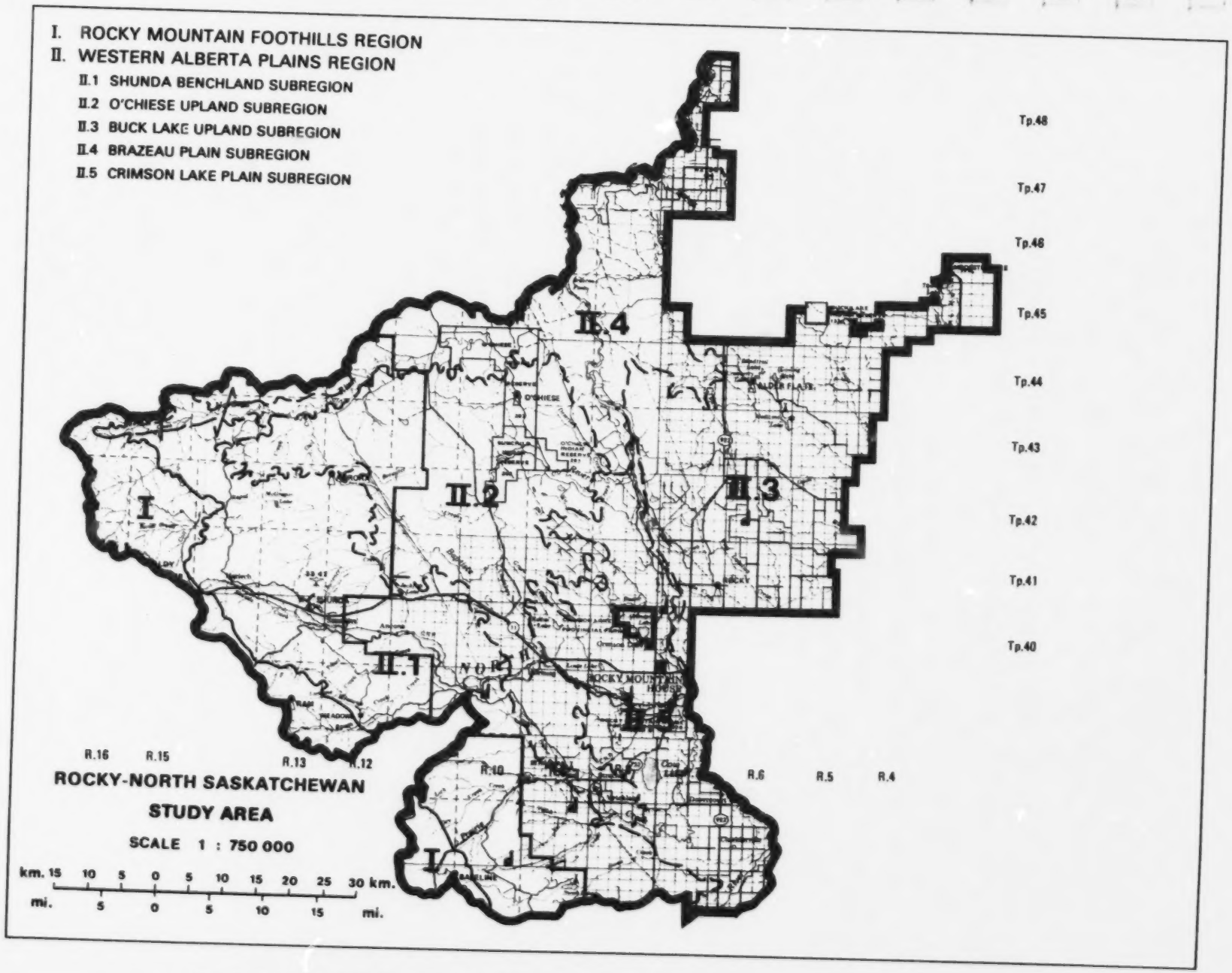

Fig. 2: PHYSIOGRAPHIC SUBDIVISION OF THE ROCKY NORTH SASKATCHEWAN STUDY AREA

3.1 Rocky Mountain Foothills Region

This region occurs in the southwestern margin of the area and consists of a series of steep, approximately parallel ridges aligned in a northwestern to southeastern direction. The elevation increases from 1 300 m along its northeastern boundary to 2 180 on the west of Brazeau Range. The lowest elevation, on the North Saskatchewan River, is about 1 150 m above sea-level.

The bedrock consists mainly of Lower Cretaceous, Jurassic and Triassic rocks. They are composed chiefly of dark gray to black siltstone; dolomitic siltstone and limestone; dary gray to black shale; chloritic and feldspatic sandstones (Green, 1972). The Brazeau Range, the most prominent topographic feature of the area, is underlain by Calcareous Paleozoic rocks (Erdman, 1950). They consist mainly of limestone and dolomite, black nodular and calcareous shale (Green, 1972).

Saprolite (residual material) which has formed *in situ* by the alteration of the underlying bedrock through weathering, mantles most of the Foothills. It is found on the ridg and on the valley slopes. The vegetative cover now established is dense enough to prevent major disturbances. Residual materials range widely in depth and development. Those on the upper slopes are generally shallow and include large amounts of rock fragments derived from the underlying bedrock. Bare rock is present locally, especially on the crests of some of the ridges. The thickest deposits occur at or near the lower slopes. In some of these areas, considerable colluvial material is found due to upslope erosion and subsequent downslope deposition. Till material mantles the lower slopes of the valleys. It occurs generally as a veneer over the bedrock, and, on steeper slopes, includes high proportions of sandstone and shale fragments incorporated from the underlying bedrock.

The general landscape is characterized by ridged and inclined landforms with slopes ranging from nine to 100 per cent. Some small areas along the Nordegg River, Swale and Colt Creeks have undulating and inclined landforms with slopes of six to 15 per cent.

Soils are mainly well-drained Eluviated Eutric Brunisols characterized by organic surface horizons, prominent Ae horizons and a Bm or weakly expressed Bt horizon. The C horizon is usually sandy loam and contains high proportions of rock fragments. Brunisolic soils on steeper slopes have thinner sola and the bedrock is generally within 50 cm of the surface. These soils grade to Regosols in some areas where the soil development is affected by the steepness of the topography and the process of downslope mass wastage. The soil profiles generally vary from a shallow, purely residual profile on steep slopes, to deep colluvium at the base of some of the slopes. In some areas, soils are of limited occurance and are simply composed of talus and scree materials.

The Foothills region within the study area is divided into three geomorphic systems (Figure 3). Two saprolite geomorphic systems and a morainal system are identified on the basis of parent geologic material and landform.

A schematic distribution of the geomorphic systems within the region is illustrated in Figure 4 with their generalized description (Table 2).

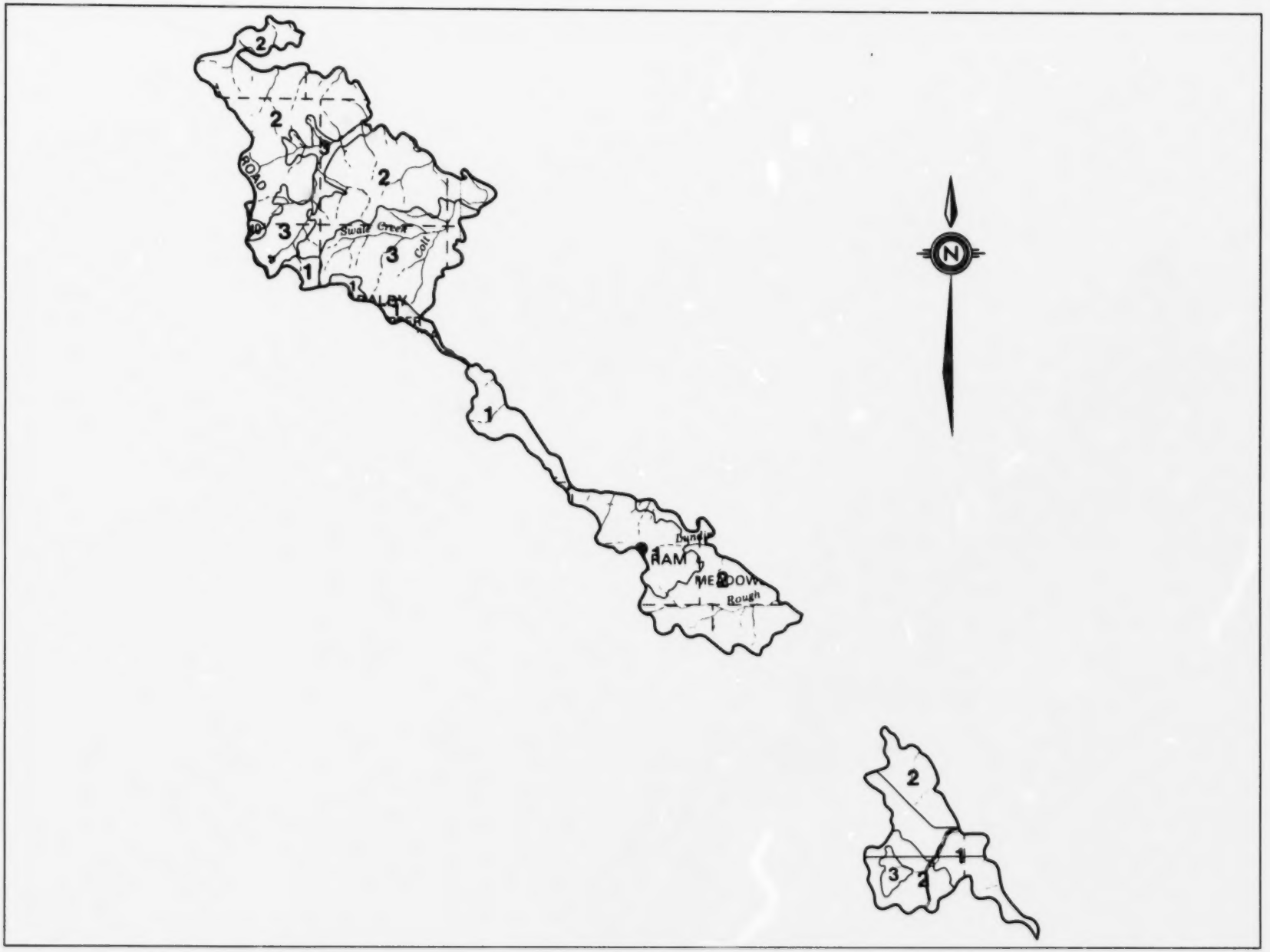

Fig. 3: GEOMORPHIC SYSTEMS OF THE FOOTHILLS REGION

Figure 4. Block-diagram sketch indicating landscape position of the geomorphic systems in the Foothills region.

Table 2.

KEY TO MAJOR CHARACTERISTICS OF THE GEOMORPHIC SYSTEMS IN THE FOOTHILLS REGION

Geomorphic System	Genetic Composition	Surface Expression Slope	Soils
1	Saprolite, some colluvium	Ridged, inclined; 45-100 per cent	Eluviated Eutric Brunisols, some Orthic Regosls, occasional bedrock exposure
2	Saprolite, morainal veneer over bedrock some colluvium	Ridged, inclined; 15-70 per cent	Eluviated Eutric Brunisols, some Orthic Regosols
3	Morainal veneer and blanket over bedrock	Ridged, inclined, rolling, indulating; 6-30 per cent	Eluviated Eutric brunsols

3.2 Western Alberta Plains Region

This region is the largest physiographic unit in the study area and extends east and northeast from the Foothills (Figure 2). Elevations range from 800 m in the Brazeau Plain subregion to 1 525 m in the Shunda Benchland subregion.

The area is underlain by the Paskapoo Formation of Paleocene age. This formation is composed of weakly-consolidated beds of sandstone and siltstone, with interbedded strata of shale, coal and chert conglomerate (Roed, 1968). The more resistant sandstone beds of this unit form sandstone ridges, particularly in the Shunda Benchland subregion.

The general landscape is characterized by level to very strongly-rolling topography and includes local landforms varying from horizontal bogs to bedrock-controlled ridges. It also includes a highland plateau region possessing flat summits and steep-sided slopes.

The surficial material of the Plains region is dominantly till, glaciolacustrine and glaciofluvial sediments, eolian and organic deposits. Minor amounts of fluvial materials along the stream courses are also present.

The Plains region is divided into five physiographic subregions (Figure 2) and includes 29 geomorphic systems.

3.3 The Shunda Benchland Subregion

This physiographic subregion covers the southwestern part of the study area within the Western Alberta Plains region. The elevations range from 1 075 to 1 525 m. It is an undulating to strongly-rolling area affected by the underlying bedrock and dissected by the North Saskatchewan, Baptiste and Nordegg Rivers and

their tributaries. Elevated plateaus separated by narrow, moderately to strongly-sloping valleys are common, particularly in the southeastern part of the subregion. There are small areas of drumlinoid features in the Alexo and Saunders area. These ridges mainly trend in a southeasterly direction indicating the direction of local ice lobe movement.

The surficial material of the subregion is dominantly till and includes minor areas of glaciolacustrine, glaciofluvial, organic and recent fluvial deposits. A thin, five to 25 cm thick, sandy loam to silt loam loess material mantles much of the lower slopes. The till occurs as a veneer or blanket over most of the area and the topography is strongly influenced by the underlying bedrock. In some of the creek basins, such as Colt, Trout, Rough, Lick, Dry and Base Line Creeks, the till is found largely as a thin veneer plastered on the steep valley slopes. The glaciolacustrine deposits are found only in the vicinity of a few unnamed creeks east of Rough Creek. At some higher elevations the boundary between the lacustrine and till deposits is not well defined. Complexes of lacustrine veneer with till exist. In these areas the glaciolacustrine sediments were probably deposited in a superglacial land and let down onto the till as the ice melted. The glaciofluvial deposits occupy the valley bottoms of some of the small streams originating from the Brazeau Range. They are also found as isolated terraces and meltwater deposits along the North Saskatchewan River. The organic sediments are generally confined to undrained channels and depressions. Seepage and groundwater discharge have also caused small areas of organic deposits to develop at the base of a few steep slopes. Recent fluvial materials occur on river and stream floodplains, with the largest areas being found in the valley of the North Saskatchewan River.

The soils of the subregion are dominantly Eluviated Eutric Brunisols and Brunisolic Gray Luvisols with lesser amounts of Orthic Gray Luvisols. Poorly drained Gleysols and very poorly drained Organic soils are found in the level and depressional areas and constitute only a small proportion of the subregion.

The Eluviated Eutric Brunisols are confined to the gently to very strongly sloping areas where the landscapes are controlled by the topography of the underlying bedrock and consist of elevated plateaus, and elongated, irregular erosional scarps. These soils are identified by a thin (one to five cm thick), moderately decomposed organic surface horizon (L-H) overlying a leached, five to eight cm thick, light brownish gray, sandy loam Ae horizon. The Bm horizon in which the pH is usually 5.5 or higher, is generally brown to dark brown in color, loam to clay loam in texture, and occurs within 20 cm of the surface. The C horizon is dark yellowish brown, generally clay loam in texture, and contains high proportions of rock fragments. Soils with rock substrates within 50 cm of the surface are common. In areas where a loessial overlay is present, soils have brownish sola with textures varying from very fine sandy loam to silty loam.

The Brunisolic Gray Luvisols are found in gently to moderately sloping areas associated with good drainage conditions. The striking feature of these soils is the presence of a Brunisolic sequence of Ae and Bm horizons in an older Ae horizon that overlies a continuous textural Bt horizon. The texture of the surface horizons is generally sandy loam to loam, while that of the Bt horizon varies from clay loam to clay. In areas where the soils are associated with loess deposits, the soil solum has higher chromas, redder hues and weaker structures. These soils have very fine sandy loam or silty loam surface horizons, and silty clay loam to silty clay Bt horizons which in most profiles are found to encroach into the underlying till.

The Orthic Gray Luvisols are present only on smoother landscapes where the effects of erosion are minimal. These soils are characterized by a thin (three to eight cm thick), semi-decomposed organic surfaace horizon (L-H) overlying a light colored, three to eight cm thick, sandy loam Ae horizon. The Bt horizon, in which clays are the dominant accumulation product, often occurs within 30 cm of the surface. This horizon is generally brown to dark brown, clay loam to silty clay in texture, and exhibits moderately developed fine subangular blocky structure. The increased clay content of this horizon provides a higher water-holding capacity than the horizons above and below.

The poorly drained Gleysolic soils are found in low-lying, level to depressional areas where the surface drainage is slow and the internal drainage is impeded because of a high water table. They may have organic surface horizons up to 60 cm thick and are characterized by the presence of distinct mottles of high chroma within 50 cm of the mineral surface.

The Organic soils in the are occur in very poorly drained areas which experience continuous groundwater discharge and are often saturated with water throughout most of the summer. They are characterized by the presence of more that 60 cm of unconsolidated peat. The Organic soils are separated on the basis of the degree of organic decomposition. Fibric material is relatively raw and undecomposed, mesic material is partly decomposed, and humic material is so well decomposed that very little of the organic fibres are discernible.

The Shunda Benchland subregion is divided into nine geomorphic systems (Figure 5) based primarily on landform and parent geologic material. The geomorphic systems identified are morainal, fluvial, glciofluvial and glaciolacustrine in order of prominence.

A schematic distribution of the geomorphic systems within the subregion and their generalized description is given in Figure 6 and Table 3.

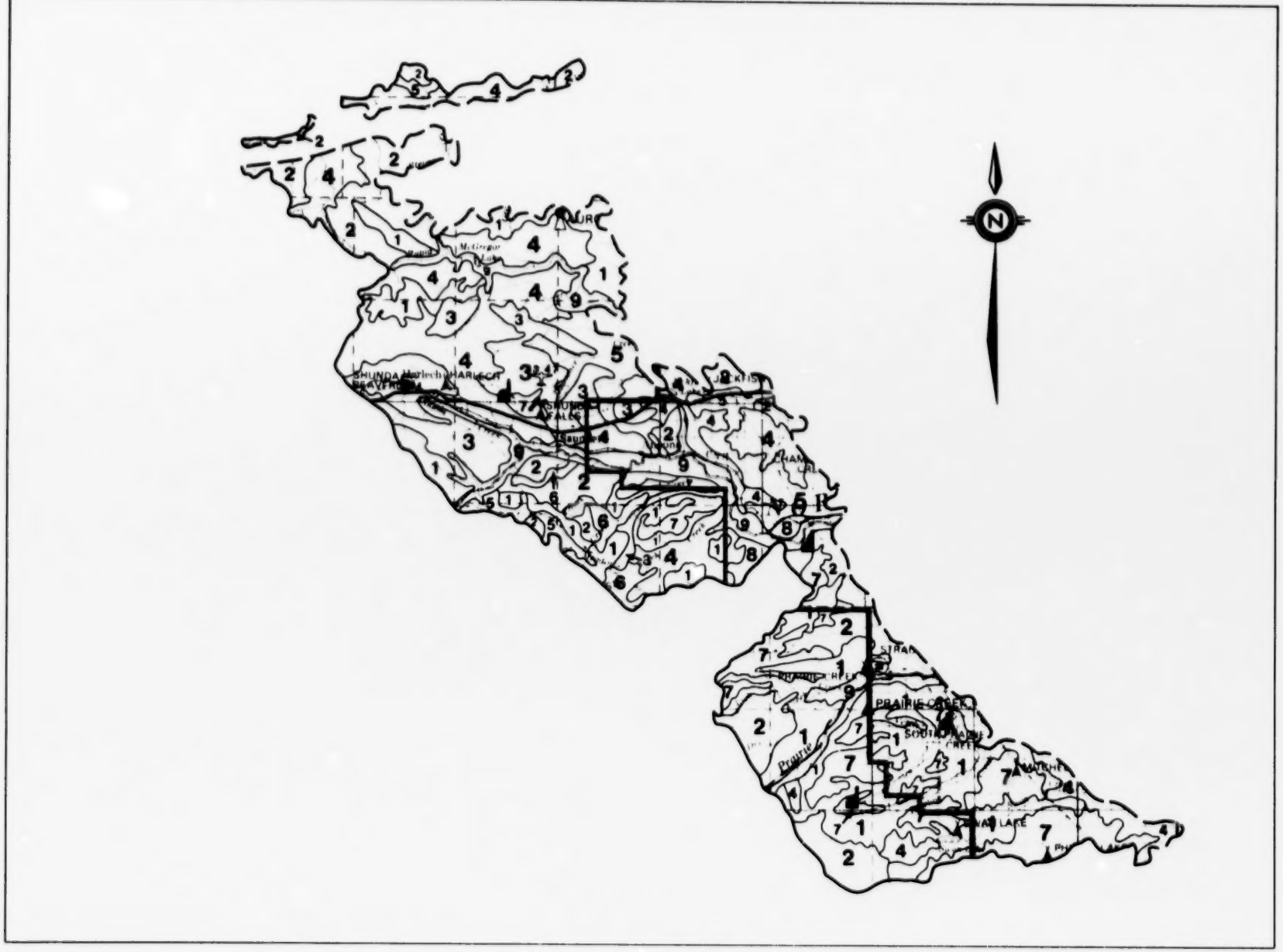

Fig. 5: GEOMORPHIC SYSTEMS OF THE SHUNDA BENCHLAND SUBREGION

Figure 6. Block-diagram sketch indicating landscape position of the geomorphic systems in the Shunda Benchland subregion.

Table 3

KEY TO MAJOR CHARACTERISTICS OF THE GEOMORPHIC SYSTEMS IN THE SHUNDA BENCHLAND SUBREGION

Geomorphic System	Genetic Composition	Surface Expression Slope	Soils
1.	Morainal veneer and blanket over bedrock, some saprolite, glaciofluvial and organic	Ridged, inclined, undulating; 3 - 45 per cent	Eluviated Eutric Brunisols, Brunisolic Gray Luvisols, some Orthic Regosols and Organic soils
2.	Morainal Veneer and blanket over bedrock	Ridged, inclined, rolling, undulating; 3 - 30 per cent	Eluviated Eutric Brunisols, Brunisolic Gray Luvisols
3.	Morainal veneer and blanket over bedrock	Ridged, inclined, undulating; 3 - 15 per cent	Eluviated Eutric Brunisols, some Brunisolic Gray Luvisols
4.	Morainal veneer and blanket over bedrock, some organic	Undulating, level, inclined, ridged; 1 - 9 per cent	Brunisolic Gray Luvisols, Eluviated Eutric Brunisols, some Organic soils
5.	Morainal, organic	Level, undulating; 1 - 3 per cent	Brunisolic Gray Luvisols, Organic soils
6.	Glaciofluvial, some organic	Undulating, level, ridged, hummocky; 1 - 30 per cent	Eluviated Dystric Brunisols, some Organic soils
7.	Morainal blanket over bedrock	Undulating; 2 - 9 per cent	Brunisolic Gray Luvisols, Eluviated Eutric Brunisols
8.	Glaciolacustrine, some organic	Level, Undulating; 1 - 5 per cent	Brunisolic Gray Luvisols, some Organic soils
9.	Fluvial	Level, undulating; 1 - 5 per cent	Orthic Regosols, Orthic Humic Regosols, some organic soils

3.4 The O'Chiese Upland Subregion

This subregion occupies the central part of the area (Figure 2) where the elevations range from 910 to 1 275 m. It is characterized by level to strongly-sloping topography and includes local landforms varying from horizontal bogs to bedrock-controlled ridges. The area is dissected mainly by the Baptiste River and its tributaries.

Glacial till of varying thickness is the major surficial deposit; however, inclusions of glaciolacustrine sediments, eolian and organic deposits are also present. Much of the area is overlain by 10 to 25 cm of loess with textures ranging from fine sandy loam to silty loam. The till occurs as a blanket over most of the area and the topography is somewhat influenced by the underlying bedrock. The texture of the till is generally clay loam but silty clay loam and clay textures have been observed. In some areas, adjacent to stream courses, the till has a sandy loam to sandy clay loam texture which could be the result of reworking by glacial meltwaters. The glaciolacustrine deposits are found along the floodplains of some of the streams such as the Stevens, Brewster, North Prairie and Chambers Creeks and the Baptiste River. These sediments have silt loam to silty clay loam textures and generally occur as a veneer over till and may be overlain by organic or eolian materials. Deposits of postglacial eolian materials occupy small areas adjacent to the Crimson Lake Plain in the south-eastern part of the subregion. The deposits are dominantly sand to loamy sand in texture and occur as a veneer over till or glaciolacustrine material. The sandy overlay, being relatively thin, modifies the existing landscape only slightly. Organic deposits of varying thickness are found in the poorly drained depressional areas, portions of stream floodplains and parts of small lake basins. Most of Organic soils are at the advanced stage of decomposition and classified as Mesisol or Humisol.

The soils of the subregion consist dominantly of Eluviated Eutric Brunisols and Brunisolic Gray Luvisols in association with minor amounts of Organic and Gleysolic soils, and Eluviated Dystric Brunisols.

The Eluviated Eutric Brunisols are scattered throughout the subregion, and are found mostly on moderately sloping landforms. These soils are generally well drained and have developed on clay loam till which is often overlain by a thin, fine sandy loam to silt loam loess material. The soil profile is characterized by a thin organic (L-H) surface layer, a grayish brown to light brownish gray Ae horizon, and a brown to yellowish brown Bm horizon. The C horizon is yellowish brown and commonly occurs within 30 cm of the surface. The texture of the surface horizons is mainly sandy loam to clay loam, but silt loam textures appear to dominate where the soil is associated with a loessial overlay. Some of the Brunisolic soils have developed on sandy eolian deposits and are classified within the Eluviated Dystric Brunisol subgroup. These well to excessively drained soils have relatively thin sola with pH values less than 5.5.

The Brunisolic Gray Luvisols occupy very gentle to gently-sloping areas in the eastern part of the subregion. They differ from the Eluviated Eutric Brunisols in that they have textural Bt horizon in which clay is the main accumulation product. The upper horizons (Ae 1, Bm and Ae 2) may be developed in a fine sandy loam to silt loam overlay but the Bt horizon normally lies in the underlying till.

Poorly drained Organic and Gleysolic soils occur in concave depressions or level areas and constitute a significant proportion of the soils.

The O'Chiese Upland subregion is divided into seven geomorphic systems (Figure 7) on the basis of the parent geologic material and landform. The geomorphic systems, in order of areal prominence, are morainal, glaciolocustrine, organic, eolion and fluvial.

A schematic distribution of the geomorphic systems within the subregion is illustrated in Figure 8 with their generalized description (Table 4).

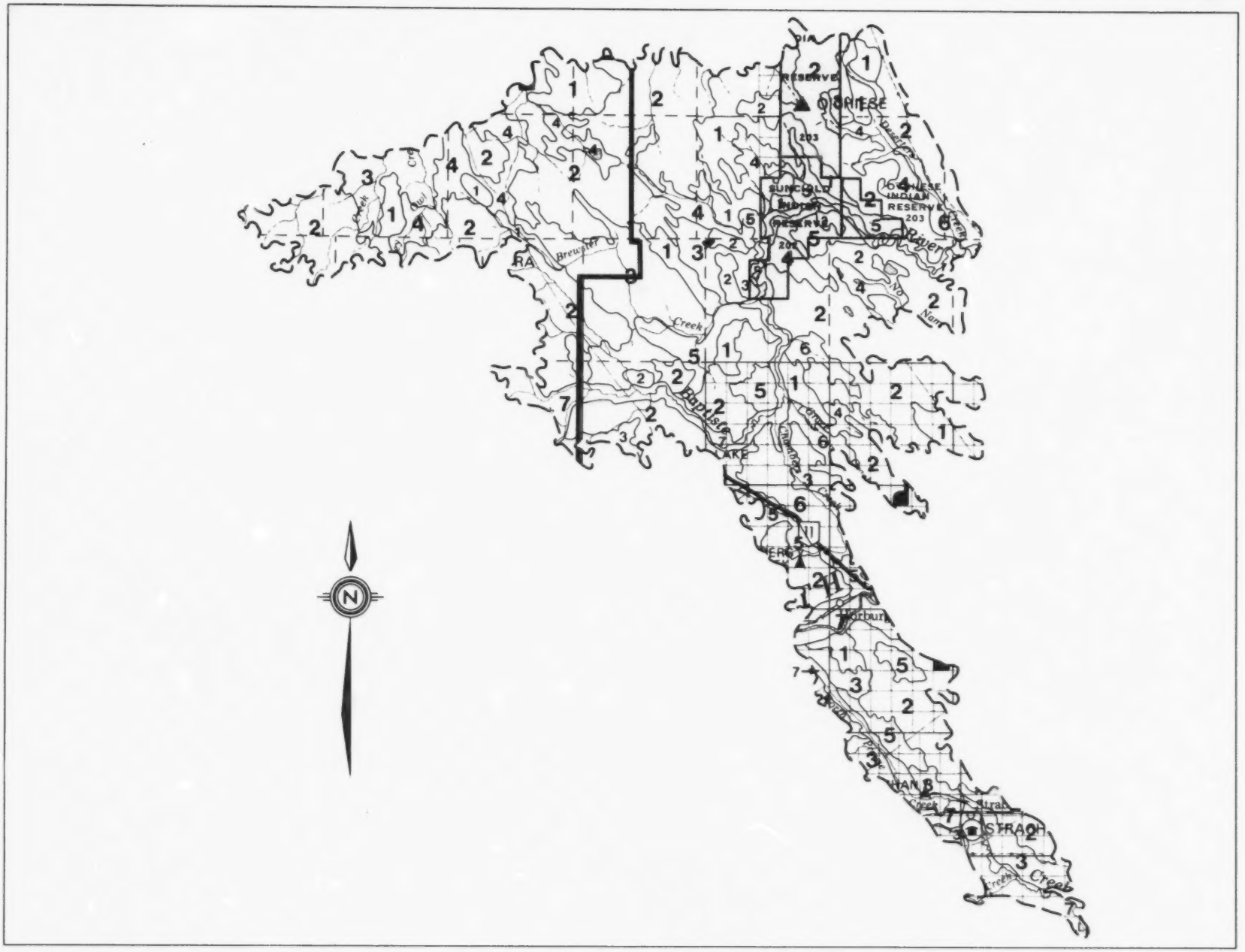

Fig. 7: GEOMORPHIC SYSTEMS OF THE O'CHIESE UPLAND SUBREGION

Figure 8. Block-diagram sketch indicating landscape position of the geomorphic systems in the O'Chiese Upland subregion.

Table 4

KEY TO MAJOR CHARACTERISTICS OF THE GEOMORPHIC SYSTEMS IN THE O'CHIESE UPLAND SUBREGION

Geomorphic System	Genetic Composition	Surface Expression Slope	Soils
1.	Morainal blanket over bedrock	Undulating inclined, rolling; ridged; 6 - 30 per cent	Eluviated Eutric Brunisols, Brunisolic Gray Luvisols
2.	Morainal blanket over bedrock, some organic, glaciolacustrine and eolian	Undulating, inclined, ridged hummocky; 1 to 15 per cent	Brunisolic Gray Luvisols, Eluviated Eutric Brunisols, some Orthic Gray Luvisols and Organic soils
3.	Morainal, organic, some glaciolacustrine and eolian	Undulating, inclined, level; 1 to 9 per cent	Brunisolic Gray Luvisols, Organic soils, some Gleysols and Eluviated Eutric Brunisols
4.	Organic, some morainal, glaciolacustrine and eolian	Level, undulating; 1 - 5 per cent	Organic soils, some Brunisolic Gray Luvisols and Gleysolic soils
5.	Glaciolacustrine, organic, some morainal and eolian	Level, undulating; 1 - 5 per cent	Organic Soils, some Brunisolic Gray Luvisols and Gleysolic soils
6.	Eolian, organic	Level, undulating, ridged; 1 - 9 per cent	Eluviated Dystric Brunisols, Organic soils
7.	Fluvial, some organic	Level, undulating; 1 - 5 per cent	Orthic Regosols, some Organic soils

3.5 The Buck Lake Upland Subregion

Areas covered by this physiographic subregion are found in the eastern part of the Plains region between the elevations of 900 to 1 120 m (Figure 2). The general landscape is characterized by level to strongly-sloping topography with undulating, hummocky, inclined and ridged surface expressions. The area east of Rose Creek is covered by hummocky moraine identified by knob-and-kettle topography. This landscape consists of a random assemblage of hummocks, ridges, and basins without any pattern or orientation of these elements. Rose Creeks, with its level to very gently-sloping floodplain, has incised into the subregion.

The surficial deposits of the subregion consist mainly of sandy clay loam to clay loam till as well as large areas of organic deposits, hummocky moraine areas. Minor amounts of glaciolacustrine and glaciofluvial materials generally occur as veneers over till. Much of the gently to moderately-sloping areas are covered by 15 to 35 cm of fine sandy loam to silt loam loess material.

The soils in the area are dominantly well drained eluviated Eutric Burnisols, Brunisolic Gray Luvisols and Orthic Gray Luvisols. Poorly drained organic and Gleysolic soils occupy lowlying areas and constitute a significant portion of the subregion. Well to rapidly drained Eluviated Dystric Brunisols developed on coarse-textured eolian or glaciolacustrine deposits are minor occurrences. In some very gently sloping areas, soil development is affected by periodic ground water discharge and the soils show imperfect drainage conditions.

The Eluviated Eutric Brunisols are found mainly in the western part of the subregion and have developed on a complex association of sandy clay loam to clay loam till with a veneer of fine sandy loam to silt loam loess. The landform is dominantly undulating moraine with small areas of inclined moraine and ridged

moraine. The soil profile is characterized by a thin organic (L-H) surface layer, a brown to grayish brown, fine sandy loam Ae horizon, and a dark brown to dark yellowish brown, silt loam Bm horizon in which the pH is usually 5.5 or higher. The C horizon is generally pale brown to brown in color, silt loam in texture, and commonly occurs within 30 cm of the surface. Some of the Brunisolic soils have developed on sandy glaciofluvial material and are classified within the Eluviated Dystric Brunisol subgroup.

The Brunisolic Gray Luvisols occupy gently to moderately-sloping areas where the loessial overlay is less than 20 cm. They are identified by the presence of a Brunisolic sequence of Ae and Bm horizons in a former Ae horizon. The upper solum consists of a well developed, generally brown to pale brown Ae 1 horizon and a yellowish brown Bm horizon. The texture of the surface horizons varies from sandy loam to silt loam. The lower solum commonly consists of a Ae 2 horizon overlying a textural B (Bt) horizon which, in most soil profiles, occurs in the underlying till material. The texture of the Bt horizon varies from clay loam to clay.

The Orthic Gray Luvisols are well to moderately well drained and have developed mainly on clay loam till. They occur extensively in the eastern part of the subregion, on hummocky moraine and occasionally on undulating moraine and ridged moraine. These soils are characterized by a thin organic surface horizon (L-H) overlying a leached, three to eight cm thick, brown to pale brown, sandy loam to loam Ae horizon. The Bt horizon, in which silicate clay has accumulated, is generally brown to dark brown in color, clay loam to clay in texture, and occurs within 25 cm of the surface. The Orthic Gray Luvisols, in a catenary sequence of soils, occupy middle and upper slope positions, with imperfectly drained Gleyed Gray Luvisols occuring on lower slopes and poorly drained Orthic Gleysols in lowlying and inter-knob areas.

The Organic soils in the subregion are generally in an advanced stage of decomposition. These soils are characterized by a dominantly humic middle tier and a sub-dominant mesic layer (Mesic Humisol) or they may be dominantly humic throughout the middle and bottom tiers (Typic Humisol). These soils occupy the level and depressional areas in the landscape and comprise a significant proportion of the subregion.

The Buck Lake Upland subregion is divided into seven geomorphic systems (Figure 9) based on parent geologic material and landform. The geomorphic systems identified are morainal, organic, glociolocustrine and eolian in order of prominence.

A schematic distribution of the geomorphic systems within the subregion is illustrated in Figure 10 and their generalized description is given in Table 5.

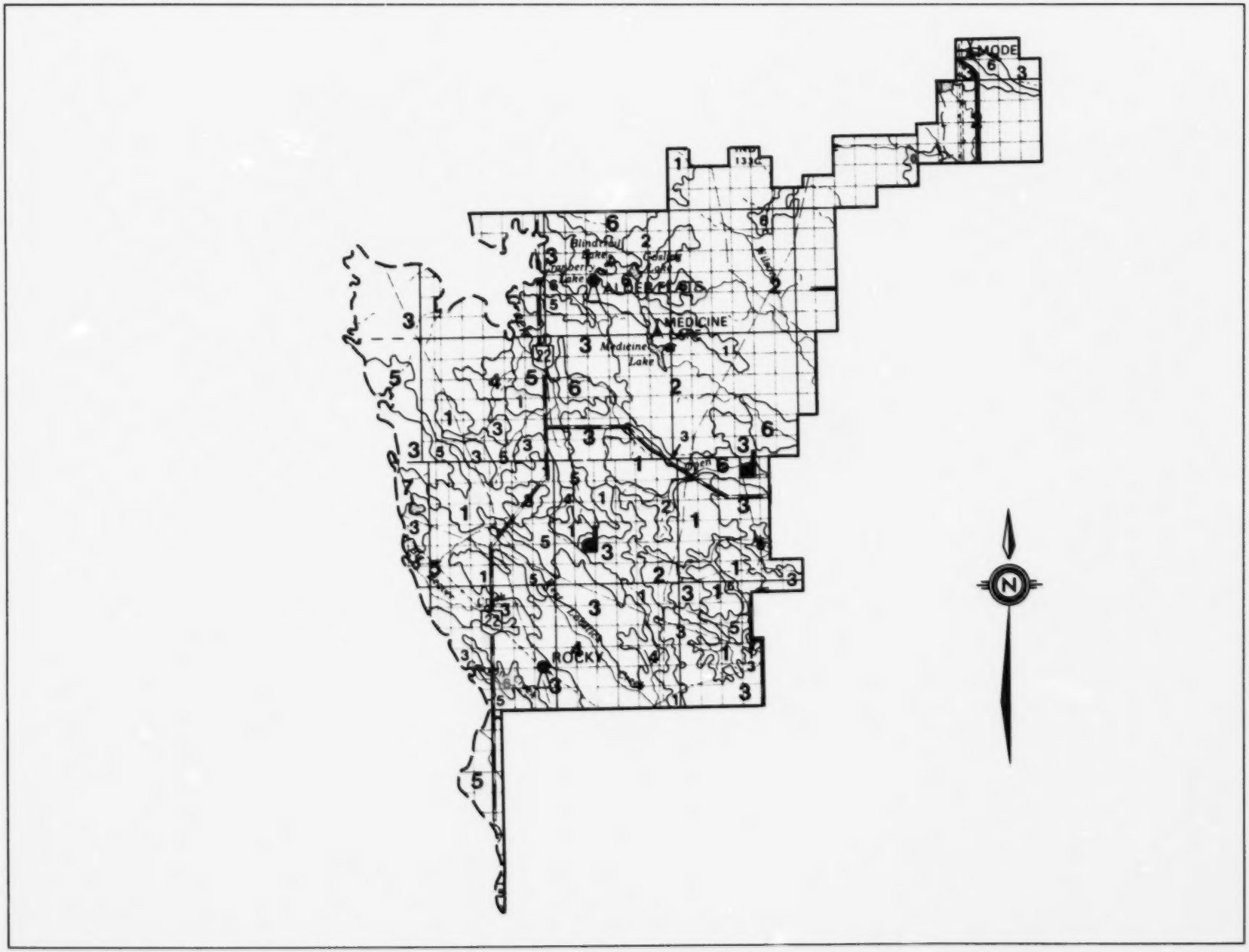

Fig. 9: GEOMORPHIC SYSTEMS OF THE BUCK LAKE UPLAND SUBREGION

Figure 10. Block-diagram sketch indicating landscape position of the geomorphic systems in the Buck Lake Upland Subregion.

Table 5

KEY TO MAJOR CHARACTERISTICS OF THE GEOMORPHIC SYSTEMS IN THE BUCK LAKE UPLAND SUBREGION

Geomorphic System	Genetic Composition	Surface Expression Slope	Soils
1.	Morainal blanket and veneer over bedrock	Undulating inclined, ridged, rolling; 3 - 30 per cent	Eluviated Eutric Brunisols, Brunisolic Gray Luvisols some Orthic Gray luvisols
2.	Morainal, organic	Hummocky, level, undulating, ridged; 1 - 9 per cent	Orthic Gray Luvisols, Organic soils, some Brunisolic Gray Luvisols
3.	Morainal, some organic, glaciolacustrine and glaciofluvial	Undulating, inclined, rolling hummocky; 1 to 9 per cent.	Orthic Gray Luvisols, Brunisolic Gray Luvisols, some Eluviated Eutric Brunisols, Organic and Gleysolic Soils
4.	Morainal, organic	undulating, level; 1 - 5 per cent	Brunisolic Gray Luvisols, Organic soils, Gleyed Brunisolic Gray Luvisols, some Gleysolic soils
5.	Glaciolacustrine veneer and blanket, overtill some organic,	Undulating, level; 1 - 5 per cent	Orthic Gray Luvisols, some Eluviated Eutric Brunisols Brunisolic Gray Luvisols, and their gleyed phases, some Organic and Gleysolic soils
6.	Organic, some morainal, glaciolacustrine and glaciofluvial.	Level, undulating, 1 - 9 per cent	Organic soils, some Orthic Gray Luvisols, Eluviated Eutric Brunisols and Gleysolic soils
7.	Eolian, organic	Level, undulating; 1 - 5 per cent	Eluviated Dystric Brunisols, Organic soils

3.6 The Brazeau Plain Subregion

This physiographic subregion occupies the northern part of the Plains region between elevations of 800 to 1 150 metres (Figure 2). It is generally a low-land relative to the rest of the study area and is dissected by the postglacial North Saskatchewan and Nordegg rivers. The general landscape is characterized by level to gently sloping topography with undulating, level, and inclined surface expressions.

The surficial deposits of the area are mainly glaciolacustrine sediments with predominently silt loam to silty clay textures. A few small till areas with undulating surface expression occur in the northern part of the subregion and in a few areas adjacent to the O'Chiese Upland. Post-glacial eolian deposits with undulating and ridged surface expressions are found along the North Saskatchewan and Nordegg rivers. These two river valleys have been infilled with sands and gravels, and in these a number of terraces have been cut. Significant areas of organic deposits generally occurring as veneers over glaciolacustrine or eolian material are also present.

The soils of the subregion are dominantly moderately well drained Orthic Gray Luvisols with minor distribution of well to rapidly drained eluviated Dystric Brunisols and Eluviated Eutric Brunisols. Poorly drained Organic and Gleysolic soils constitute a significant portion of the area.

The Orthic Gray Luvisols have developed mainly on silt loam to silty clay glaciolacustrine material and occupy a major portion of the subregion. They are identified by a thin organic surface horizon (L-H) overlying a silt loam, light brownish gray, well developed Ae horizon. The silty clay Bt horizon is brown to grayish

brown in color and consists of weakly developed aggretates with coatings of clay films. A thin transitional AB horizon may be present. These soils are slowly permeable due to their high clay content. The slow permeability, combined with the gently-sloping topography and slow surface drainage, results in a significant distribution of imperfectly and poorly drained soils. The imperfectly drained Gleyed Gray Luvisols are found on the lower slopes while the poorly drained Gleysolic soils are found in the lowlying areas.

The Eluviated Dystric Brunisols are well to rapidly drained and have developed on undulating to ridged eolian deposits. These soils are characterized by a thin organic surface horizon (L-H) overlying a strongly developed, light gray, sandy Ae horizon. The Bm horizon, in which the pH is less than 5.5, is strong brown in color and paler with depth. The C horizon is yellowish brown and generally occurs within 30 cm of the surface. The A, B and C horizons of these soils are sandy and very permeable with no restrictions to downward or lateral movement of water. Eluviated Eutric Brunisols with pH values greater than 5.5 occur on eolian veneers up to 100 cm thick over clay loam till.

The Organic soils in the area are generally at an intermediate stage of decomposition and are characterized by mesic middle and surface tiers and a mineral layer within 160 cm of the surface (Terric Mesisol).

The Brazeau Plains subregion is divided into six geomorphic systems (Figure 11) based primarily on parent geologic material and to a lesser degree on landform. The geomorphic systems, in order of prominence, are glaciolacustrine, organic, fluvial, eolian and morainal.

The distribution of the geomorphic systems within the subregion is illustrated in Figure 12 with their generalized description (Table 6).

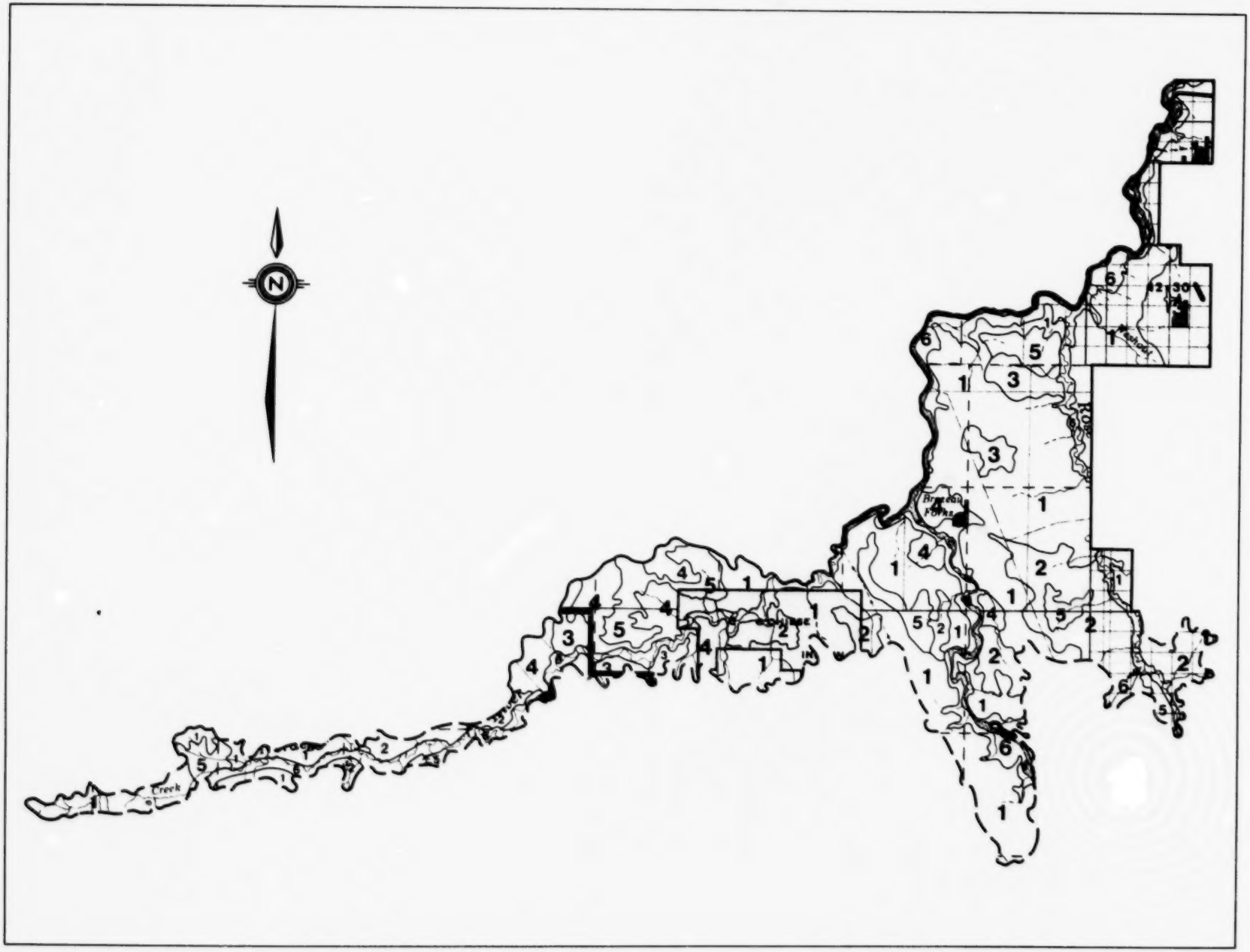

Fig. 11: GEOMORPHIC SYSTEMS OF THE BRAZEAU PLAIN SUBREGION

Figure 12. Block-diagram sketch indicating landscape position of the geomorphic systems in the Brazeau Plain subregion.

Table 6

KEY TO MAJOR CHARACTERISTICS OF THE GEOMORPHIC SYSTEMS IN THE BRAZEAU PLAIN SUBREGION

Geomorphic System	Genetic Composition	Surface Expression Slope	Soils
1.	Glaciolacustrine, some organic and morainal	Undulating, level, inclined; 1 - 9 per cent	Orghic Gray Luvisols, some Organic soils
2.	Glaciolacustrine, organic	Level, undulating; 1 - 5 per cent	Gleysolic and Organic soils some Orthic Gray Luvisols
3.	Morainal	Undulating; 3 - 9 per cent	Orthic Gray Luvisols, some Brunisolic Gray Luvisols
4.	Eolian, organic	Undulating, level, ridged; 1 - 9 per cent	Eluviated Dystric Brunisolic, Organic soils, some Eluviated Eutric Brunisols
5.	Organic, some glaciolacustrine	Level; 0 - 1 per cent	Organic and some Gleysolic soils
6.	Fluvial, some organic	Undulating, level; 1 - 5 per cent	Orthic Regosols, Orthic Humic Regosols, some Organic soils

3.7 The Crimson Lake Plain Subregion

This physiographic subregion occupies a general north-south trending zone of lowlands adjacent to the North Saskatchewan and Clearwater rivers (Figure 2). Elevation increases from 930 m along the Baptiste river, its northern boundary, to 1 100 m in the Chederville area near the Clearwater River. The general landscape is characterized by level to gently-sloping topography with undulating, level and ridged surface expressions.

The surficial deposits of the area consist mainly of glaciolacustrine and eolian materials. The glaciolacustrine sediments form the surface unit of most of the area along the Buster Creek, the area south of North Saskatchewan River, and the area between the Prairie Creek and the Clearwater River. These deposits are generally thick, silt loam to silty clay in texture, and in some places they grade laterally into clay loam till deposits forming a thin veneer at the surface. The sandy eolian materials are found largely in the No Name Creek area, in the areas between Cow Lake and the Prairie Creek, and in the area extending northwest from the Clearwater River to the Prairie Creek. These deposits are generally thick. However, in some areas they overlie till or lacustrine deposits and may be overlain by organic materials. Significant areas of organic sediments associated with eolian and glaciolacustrine deposits are also present. an extensive area of glaciofluvial materials is found adjacent to Cow Lake.

The soils of the subregion are dominantly Eluviated Dystric Brunisols and Brunisolic Gray Luvisols in combination with minor areas of Eluviated Eutric Brunisols and Orthic Gray Luvisols. Organic soils cover a significant portion of the area.

The Eluviated Dystric Brunisols are rapidly drained and have developed on deep sandy eolian deposits with undulating and ridged surface expressions. These soils are identified by a thin organic surface horizon (L-H) overlying a light brownish gray, bleached, sandy Ae horizon. The Bm horizon, in which the pH is generally less than 5.5, is brown to strong brown in color, sandy in texture and occurs within 20 cm of the surface. The C horizon is yellowish brown and consists of fine and medium-sized sands. Soils developed on eolian veneers over clay loam till or silty clay glaciolacustrine material have higher pH values (more than 5.5) and are included in the Eluviated Eutric Brunisol soil subgroup.

The Brunisolic Gray Luvsiols are well to moderately well drained soils developed mainly on silt loam to silty clay glaciolacustrine sediments and to a lesser extent on clay loam till material. These soils are characterized by a distinct Ae horizon, a Bm horizon and a textural Bt horizon. The texture of the surface horizons is commonly silt loam, while the Bt horizon varies from silty clay loam to clay. Some soil profiles exhibit only an Ae and Bt horizon sequence in the solum and are classified as Orthic Gray Luvisols.

The Organic soils occur in poorly and very poorly drained depressions and level areas. They are generally at an intermediate to advanced stage of decomposition and consist of a dominantly humic middle tier and a subdominant mesic layer (Mesic Humisol). These soils may also have mesic middle and surface tiers and a mineral contact occuring within 160 cm of the surface (Terric Mesisol).

The Crimson Lake Plain subregion is divided into six geomorphic systems (Figure 13) based primarily on parent geologic material and, to a lesser degree, landform. The geomorphic systems indified are glaciolacustrine, morainal, eolian and organic.

The distribution of the geomorphic systems is illustrated in Figure 14 and their generalized description is given in Table 7.

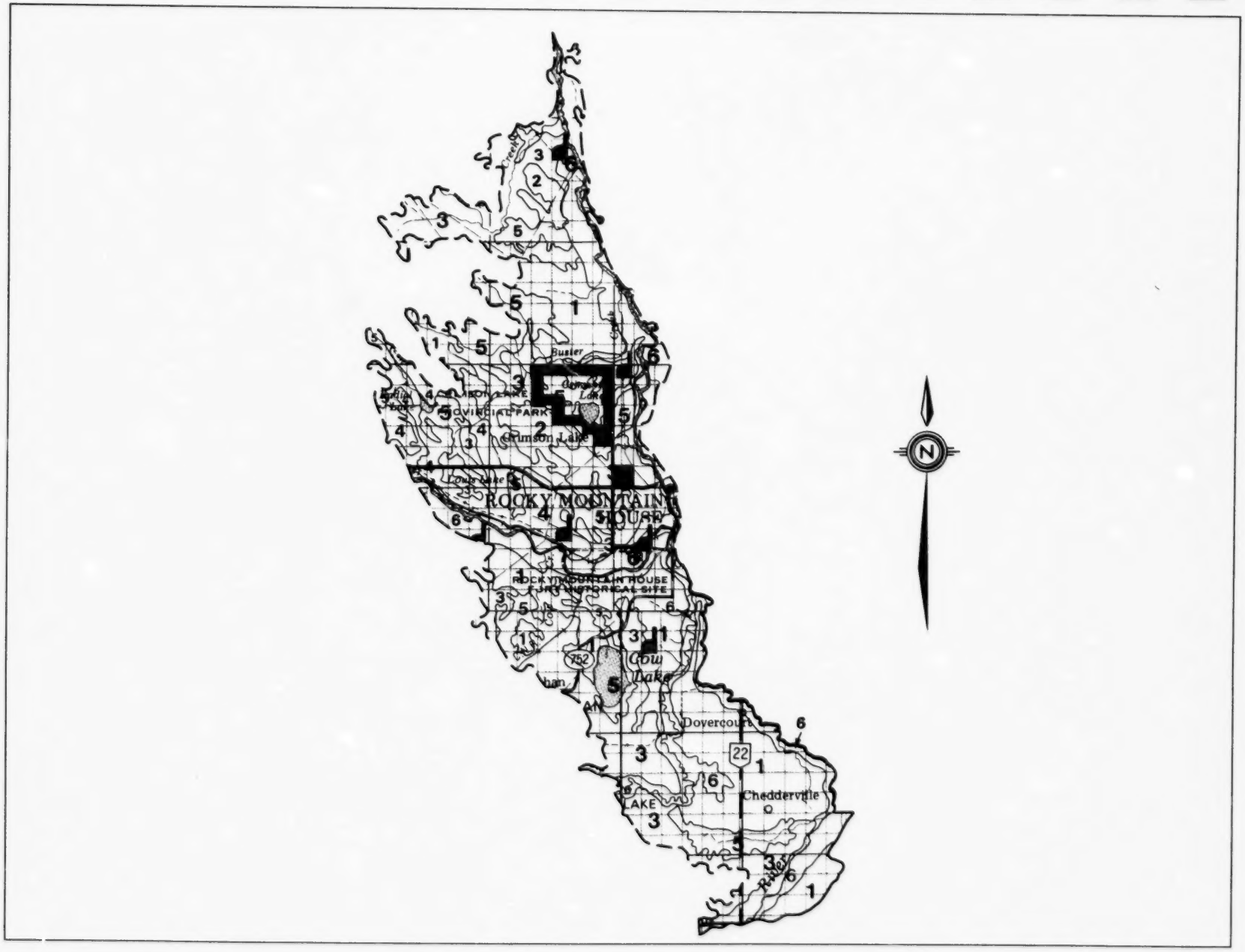

Fig. 13: GEOMORPHIC SYSTEMS OF THE CRIMSON LAKE PLAIN SUBREGION

Figure 14. Block-diagram sketch indicating landscape position of the geomorphic systems in the Crimson Lake Plain subregion.

Table 7

KEY TO MAJOR CHARACTERISTICS OF THE GEOMORPHIC SYSTEMS IN THE CRIMSON LAKE PLAIN SUBREGION

Geomorphic System	Genetic Composition	Surface Expression Slope	Soils
1.	Glaciolacustrine, organic, some eolian	Level, undulating; 1 - 9 per cent	Orthic Gray Luvisols, Brunisolic Gray Luvisols, Organic soils, some Eluviated Eutric and Eluviated Dystric Brunisols
2.	Morainal, some eolian and organic	Level, undulating, inclined 1 - 9 per cent	Eluviated Dystric Brunisols, Brunisolic Gray Luvisols, some Organic soils
3.	Eolian, organic, some glaciofluvial	Level, undulating, ridged; 1 - 9 per cent	Eluviated Dystric Brunisols, Organic soils
4.	Eolian veneer and blanket over till, some morainal	Undulating; 3 - 9 per cent	Eluviated Dystric Brunisols, some Eluviated Eutric Brunisols
5.	Organic, some eolian	Level, undulating; 1 - 5 per cent	Organic soils, some Eluviated Dystric Brunisols
6.	Fluvial, some organic	Undulating, level; 1 - 5 per cent	Orthic Regosols, Orthic Humic Regosols, some Organic soils

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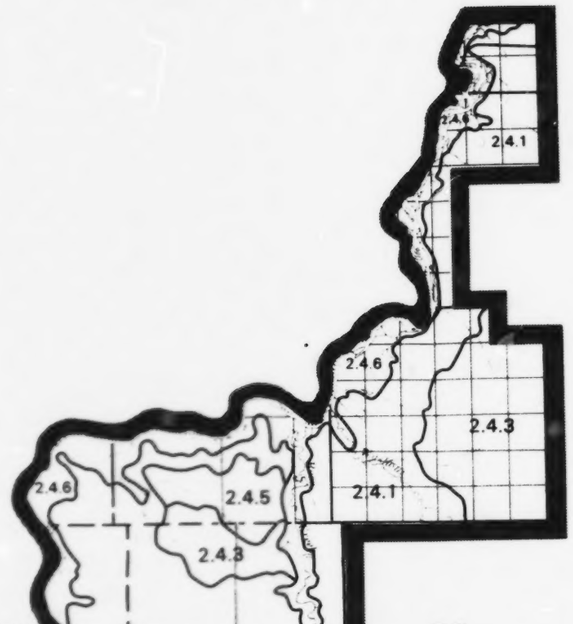
GEOMORPHIC SYSTEMS
OF THE

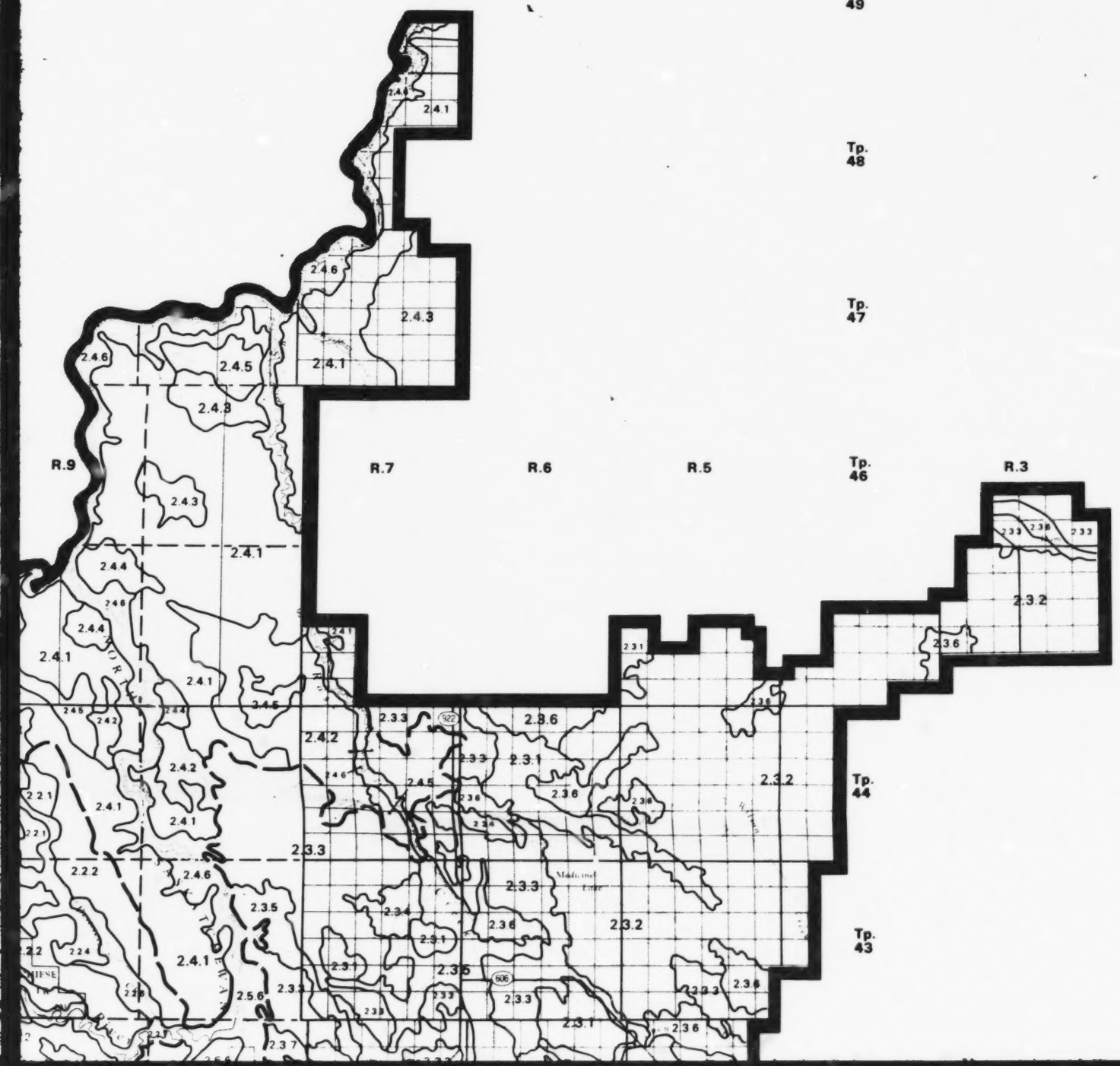
ROCKY NORTH SASKATCHEWAN STUDY AREA

SCALE 1 : 250 000

WEST OF THE FIFTH MERIDIAN

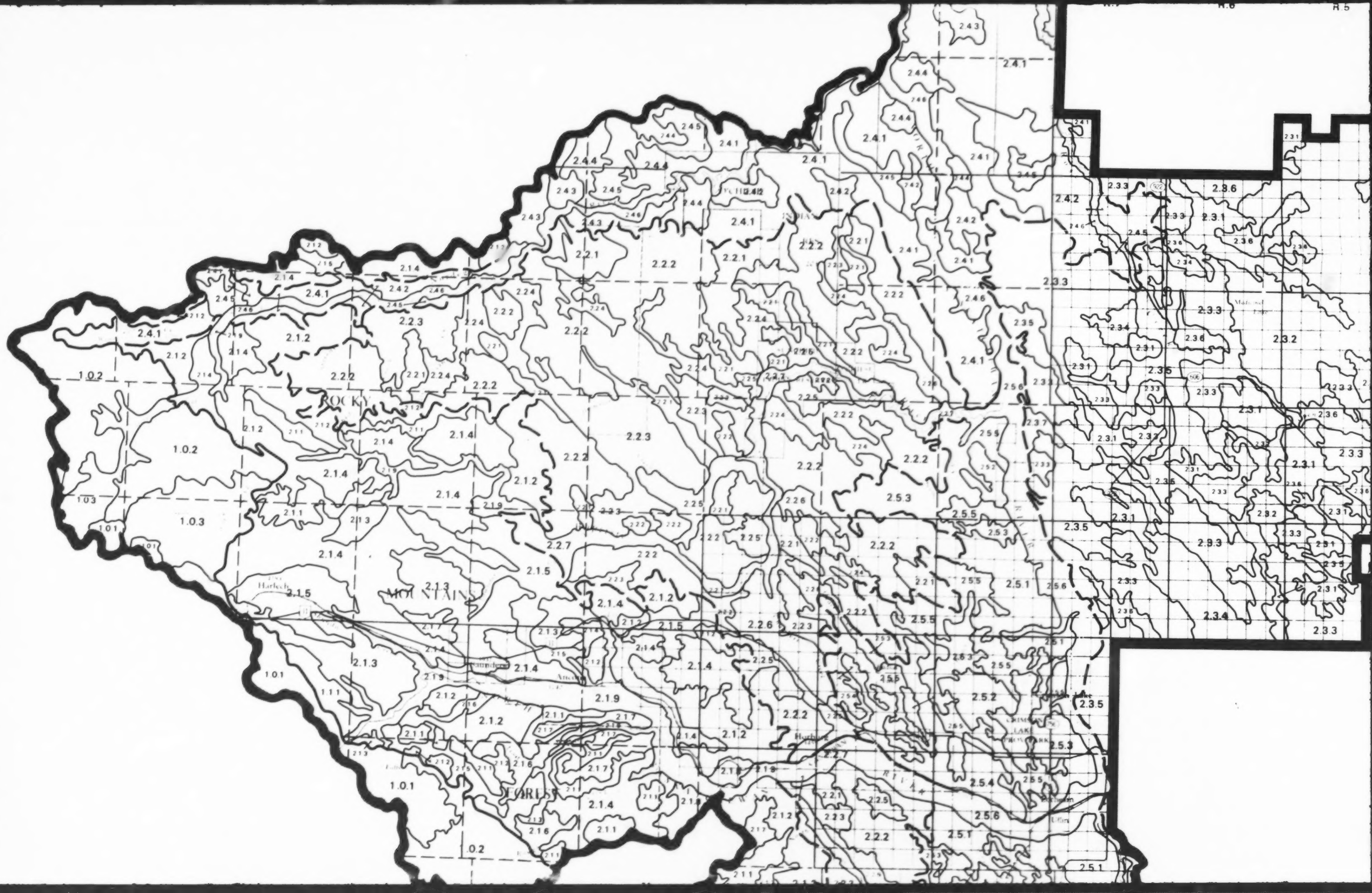


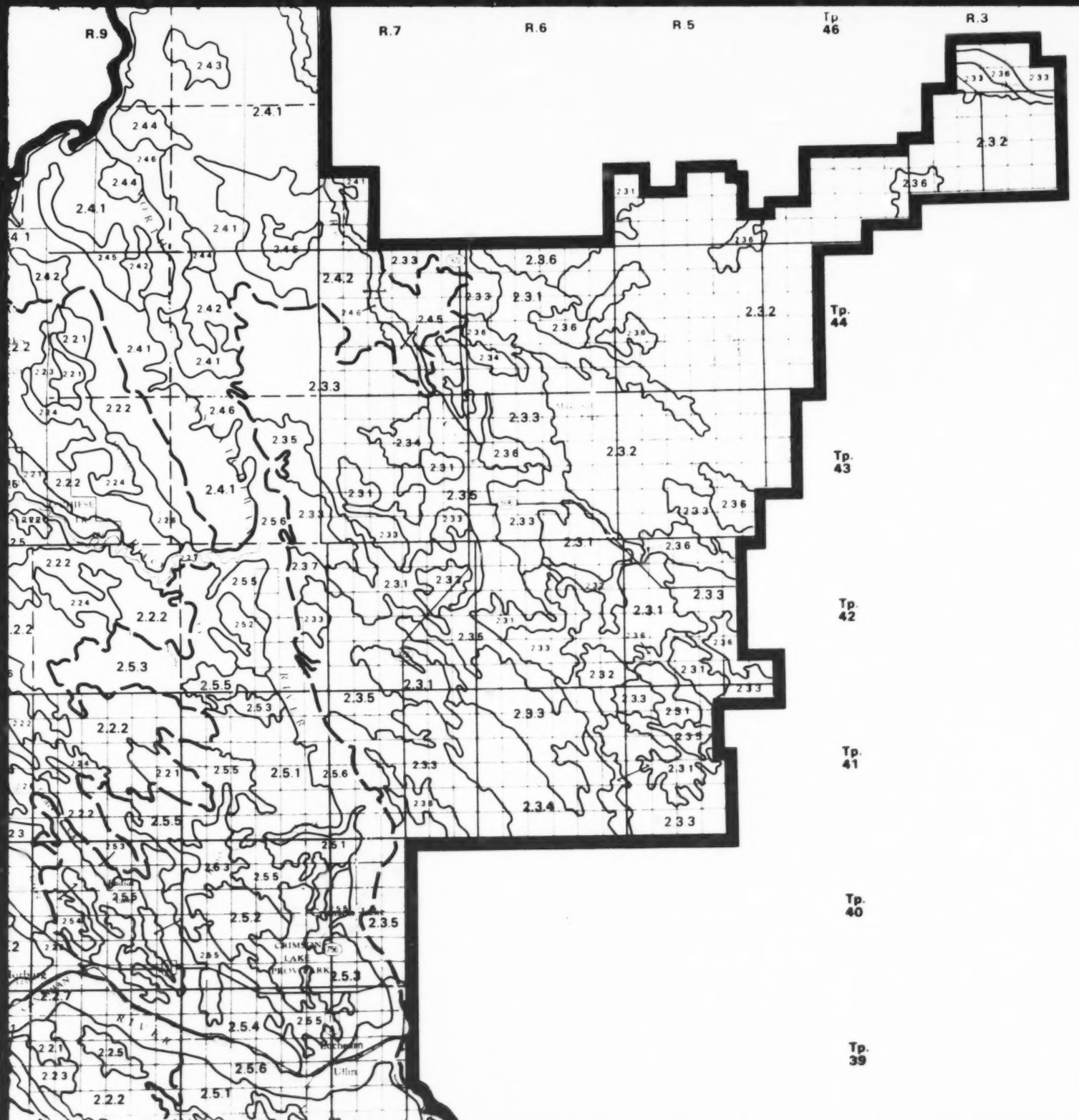
R.16 R.15 R.14 R.13 R.12 R.11 R.10 R.9 R.7 R.6



LEGEND

Geomorphic System	Parent Geological Material	Surface Expression Slope	Soils
1. ROCKY MOUNTAIN FOOTHILLS REGION			
Steep, approximately parallel ridges with elevations ranging from 1300 to 2180 m asl. The bedrock consists of Cretaceous rocks, mainly sandstones and shales. The surficial materials are saprolite, morainal and some colluvium. Soils are often shallow with bedrock exposures on steep slopes.			
1.0.1	Saprolité, some colluvium	Ridged, inclined; 45 — 100 percent	Eluviated Eutric Brunisols, some Orthic Regosols; occasional bedrock exposures
1.0.2	Saprolite, morainal veneer over bedrock, some colluvium	Ridged, inclined; 15 — 70 percent	Eluviated Eutric Brunisols, some Orthic Regosols
1.0.3	Morainal veneer and blanket over bedrock	Ridged, inclined, rolling, undulating; 6 — 30 percent	Eluviated Eutric Brunisols
2. WESTERN ALBERTA PLAINS REGION			
Level to very strongly rolling plain and upland areas with elevations ranging from 800 to 1525 m asl. The bedrock is composed of Paleocene rocks and consists largely of weakly consolidated sandstone and siltstone, with interbedded strata of shale, coal and chert conglomerate. The surficial materials are dominantly morainal, and to a lesser extent, saprolite, glaciofluvial, glaciolacustrine, eolian and organic.			
2.1 Shunda Benchland Subregion			
Undulating to very strongly rolling upland dissected by eastword-flowing streams. Elevated plateaus separated by narrow valleys are common. Elevations range from 1075 to 1525 m asl. The surficial materials are dominantly morainal and include minor amounts of glaciofluvial, glaciolacustrine, fluvial and organic deposits.			
2.1.1	Morainal veneer and blanket over bedrock, some saprolite, glaciofluvial and organic	Ridged, inclined, undulating; 3 — 45 percent	Eluviated Eutric Brunisols, Brunisolic Gray Luvisols, some Orthic Regosols and Organic soils
2.1.2	Morainal veneer and blanket over bedrock	Ridged, inclined, rolling, undulating; 3 — 30 percent	Eluviated Eutric Brunisols, Brunisolic Gray Luvisols
2.1.3	Morainal veneer and blanket over bedrock	Ridged, inclined undulating; 3 — 15 percent	Eluviated Eutric Brunisols, some Brunisolic Gray Luvisols
2.1.4	Morainal veneer and blanket over bedrock, some organic	Undulating, level, inclined, ridged; 1 — 9 percent	Brunisolic Gray Luvisols, Eluviated Eutric Brunisols, some Organic soils
2.1.5	Morainal, organic	Level, undulating; 1 — 3 percent	Brunisolic Gray Luvisols, Organic soils
2.1.6	Glaciofluvial, some organic	Undulating, level, ridged, hummocky; 1 — 30 percent	Eluviated Dystric Brunisols some Organic soils
2.1.7	Morainal blanket over bedrock	Undulating; 2 — 9 percent	Brunisolic Gray Luvisols, Eluviated Eutric Brunisols
2.1.8	Glaciolacustrine, some organic	Level, undulating; 1 — 5 percent	Brunisolic Gray Luvisols, some Organic soils
2.1.9	Fluvial	Level, undulating; 1 — 5 percent	Orthic Regosols, Orthic Humic Regosols, some Organic soils
2.2 O'Chiese Upland Subregion			
Level to strongly rolling upland dissected mainly by the Baptiste river and its tributaries. The elevation varies from 910 to 1275 m asl. Surficial materials are dominantly morainal and include sufficient amounts of organic and minor amounts of glaciolacustrine and eolian deposits.			
2.2.1	Morainal blanket over bedrock	Undulating, inclined, rolling, ridged; 6 — 30 percent	Eluviated Eutric Brunisols, Brunisolic Gray Luvisols
2.2.2	Morainal blanket over bedrock, some organic glaciolacustrine and eolian	Undulating, inclined, ridged, level, hummocky; 1 — 15 percent	Brunisolic Gray Luvisols, Eluviated Eutric Brunisols, some Orthic Gray Luvisols and Organic soils
2.2.3	Morainal, organic, some glaciolacustrine and eolian	Undulating, inclined, level; 1 — 9 percent	Brunisolic Gray Luvisols, Organic and Gleysolic soils, some Eluviated Eutric Brunisols
2.2.4	Organic, some morainal glaciolacustrine and eolian	Level, undulating; 1 — 5 percent	Organic soils, some Brunisolic Gray Luvisols and Gleysolic soils
2.2.5	Glaciolacustrine, organic, some morainal and eolian	Level, undulating; 1 — 5 percent	Brunisolic Gray Luvisols, Organic soils, some Eluviated Eutric Brunisols


R.6
R.5
ROCKY
MOUNTAIN
FOREST



eolian		9 percent	Organic soils, some Eluviated Eutric Brunisols

			30 percent
2.1.3	Morainal veneer and blanket over bedrock	Ridged, inclined undulating; 3 — 15 percent	Eluviated Eutric Brunisols, some Brunisolic Gray Luvisols
2.1.4	Morainal veneer and blanket over bedrock, some organic	Undulating, level, inclined, ridged; 1 — 9 percent	Brunisolic Gray Luvisols, Eluviated Eutric Brunisols, some Organic soils
2.1.5	Morainal, organic	Level, undulating; 1 — 3 percent	Brunisolic Gray Luvisols, Organic soils
2.1.6	Glaciofluvial, some organic	Undulating, level, ridged, hummocky; 1 — 30 percent	Eluviated Dystric Brunisols some Organic soils
2.1.7	Morainal blanket over bedrock	Undulating; 2 — 9 percent	Brunisolic Gray Luvisols, Eluviated Eutric Brunisols
2.1.8	Glaciolacustrine, some organic	Level, undulating; 1 — 5 percent	Brunisolic Gray Luvisols, some Organic soils
2.1.9	Fluvial	Level, undulating; 1 — 5 percent	Orthic Regosols, Orthic Humic Regosols, some Organic soils

2.2 O'Chiese Upland Subregion

Level to strongly rolling upland dissected mainly by the Baptiste river and its tributaries. The elevation varies from 910 to 1275 m asl. Surficial materials are dominantly morainal and include sufficient amounts of organic and minor amounts of glaciolacustrine and eolian deposits.

2.2.1	Morainal blanket over bedrock	Undulating, inclined, rolling, ridged; 6 — 30 percent	Eluviated Eutric Brunisols, Brunisolic Gray Luvisols
2.2.2	Morainal blanket over bedrock, some organic glaciolacustrine and eolian	Undulating, inclined, ridged, level, hummocky; 1 — 15 percent	Brunisolic Gray Luvisols, Eluviated Eutric Brunisols, some Orthic Gray Luvisols and Organic soils
2.2.3	Morainal, organic, some glaciolacustrine and eolian	Undulating, inclined, level; 1 — 9 percent	Brunisolic Gray Luvisols, Organic and Gleysolic soils, some Eluviated Eutric Brunisols
2.2.4	Organic, some morainal glaciolacustrine and eolian	Level, undulating; 1 — 5 percent	Organic soils, some Brunisolic Gray Luvisols and Gleysolic soils
2.2.5	Glaciolacustrine, organic, some morainal and eolian	Level, undulating; 1 — 5 percent	Brunisolic Gray Luvisols, Organic soils, some Eluviated Eutric Brunisols
2.2.6	Eolian, organic	Level, undulating; 1 — 5 percent	Eluviated Dystric Brunisols, Organic soils
2.2.7	Fluvial, some organic	Level, undulating; 1 — 5 percent	Orthic Regosols, some Organic soils

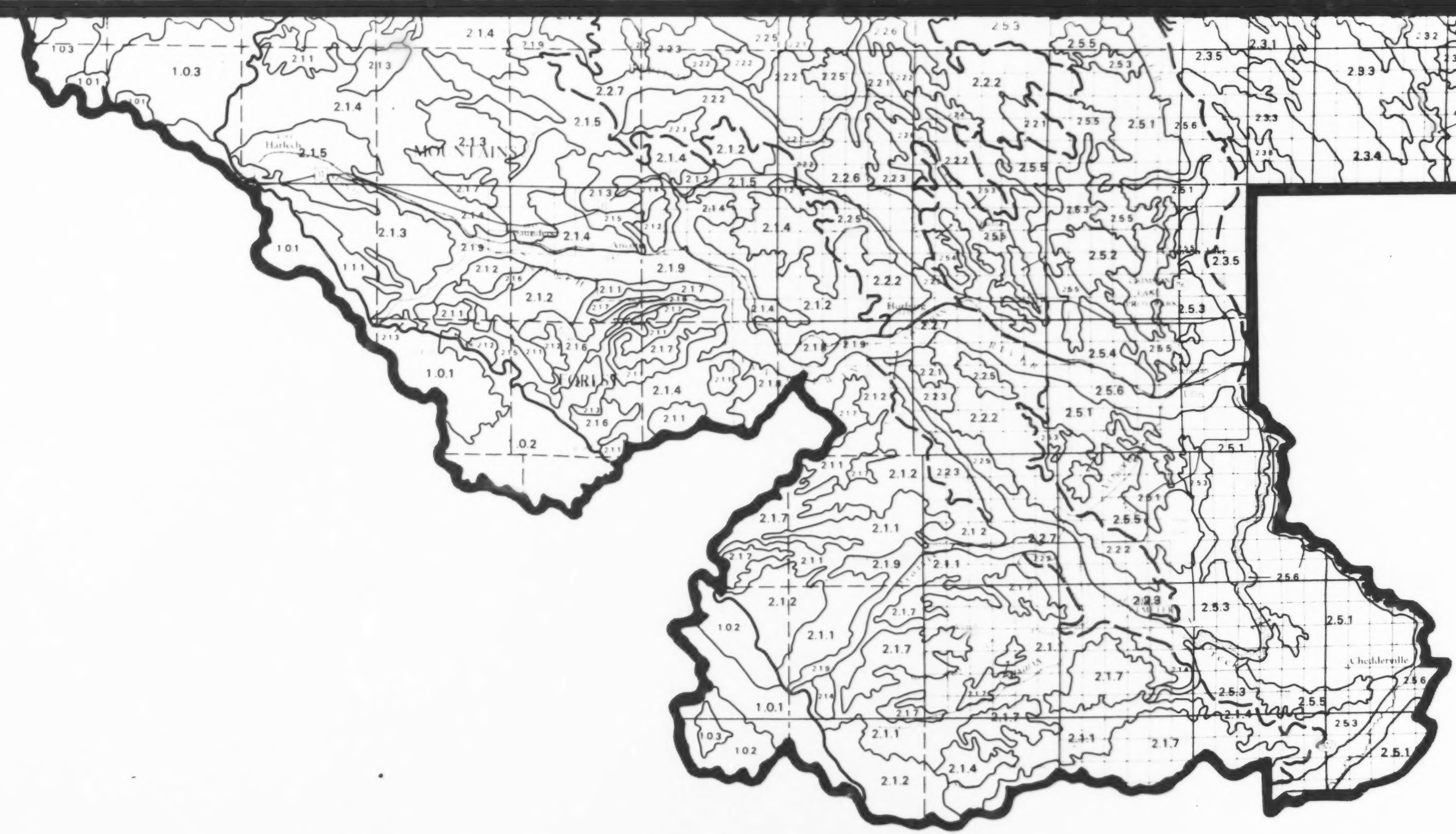
2.3 Buck Lake Upland Subregion

Level to strongly rolling with large areas of knob-and-kettle topography. Elevation ranges from 900 to 1120 m asl. The surficial materials are dominantly morainal and include significant amounts of organic, some glaciolacustrine and eolian deposits.

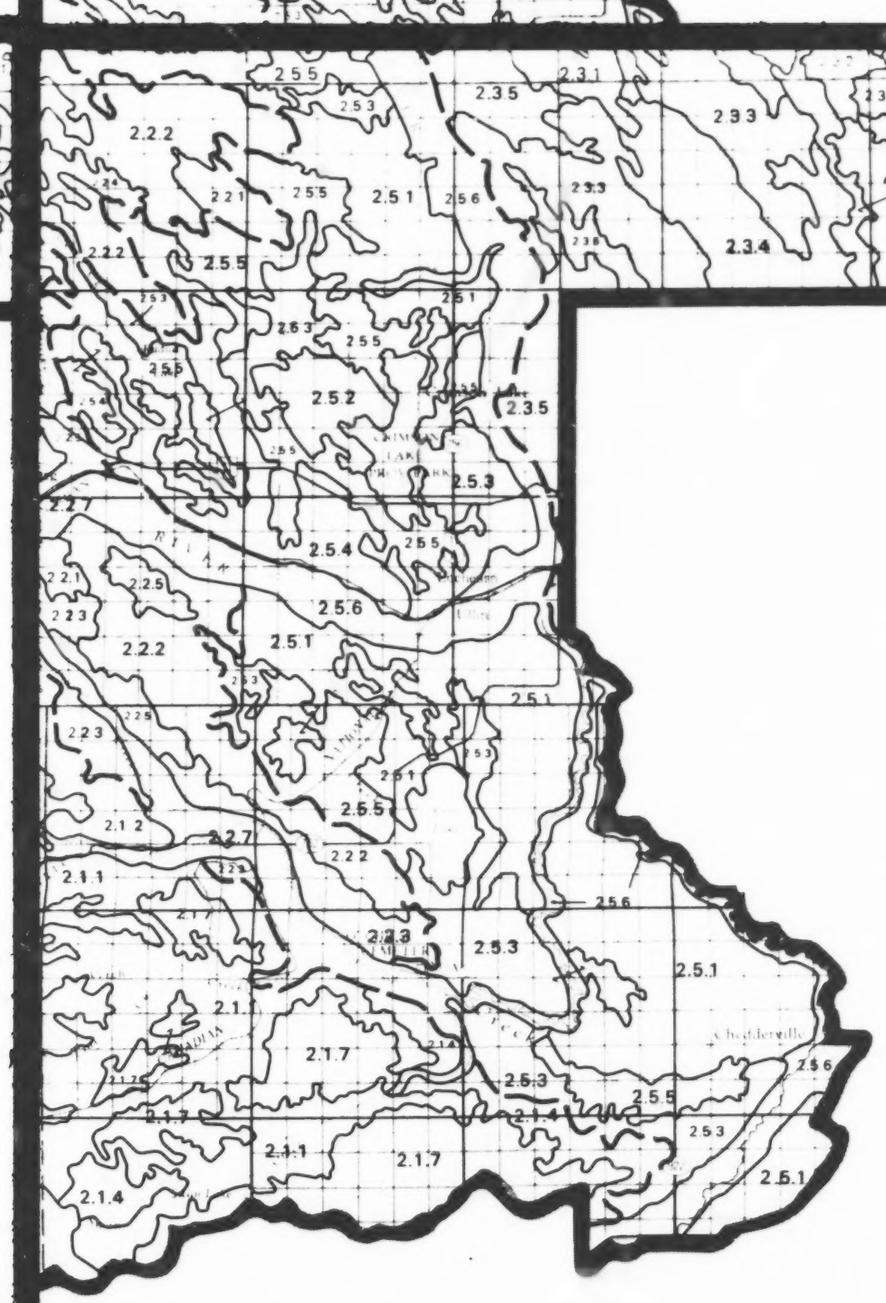
2.3.1	Morainal blanket and veneer over bedrock	Undulating, inclined, ridged, rolling; 3 — 30 percent	Eluviated Eutric Brunisols, Brunisolic Gray Luvisols, some Orthic Gray Luvisols
2.3.2	Morainal, organic	Hummocky, level, undulating, ridged; 1 — 9 percent	Orthic Gray Luvisols, Organic soils, some Brunisolic Gray Luvisols
2.3.3	Morainal, some organic, glaciolacustrine and glaciofluvial	Undulating, inclined, level, rolling, hummocky; 1 — 9 percent	Orthic Gray Luvisols, Brunisolic Gray Luvisols, some Eluviated Eutric Brunisols, Organic and Gleysolic soils
2.3.4	Morainal, organic	Undulating, level; 1 — 5 percent	Brunisolic Gray Luvisols, Organic soils, Gleyed Brunisolic Gray Luvisols, some Gleysolic soils
2.3.5	Glaciolacustrine veneer and blanket over till, some organic	Undulating, level; 1 — 5 percent	Orthic Gray Luvisols, some Eluviated Eutric Brunisols, Brunisolic Gray Luvisols and their gleyed phases, some Organic and Gleysolic soils
2.3.6	Organic, some morainal, glaciolacustrine and glaciofluvial	Level, undulating; 1 — 5 percent	Organic soils, some Orthic Gray Luvisols, Eluviated Eutric Brunisols and Gleysolic soils
2.3.7	Eolian, organic	Undulating, level; 1 — 5 percent	Eluviated Dystric Brunisols, Organic soils

2.4 Brazeau Plain Subregion

Level to gently sloping plain dissected by the North Saskatchewan and Nordegg rivers. The elevation varies from 800 to 1150 m asl. Surficial materials are mainly glaciolcustrine and include significant areas of organic, minor amounts of eolian, morainal and recent fluvial materials.



Alberta
ENERGY AND
NATURAL RESOURCES



...level to undulating plain with large areas of local sink-and-swale topography. Elevation ranges from 900 m asl. The surficial materials are dominantly morainal and include significant amounts of organic, some glaciolacustrine and eolian deposits.

2.3.1	Morainal blanket and veneer over bedrock	Undulating, inclined, ridged, rolling, 3 — 30 percent	Eluviated Eutric Brunisols, Brunisolic Gray Luvisols, some Orthic Gray Luvisols
2.3.2	Morainal, organic	Hummocky, level, undulating, ridged, 1 — 9 percent	Orthic Gray Luvisols, Organic soils, some Brunisolic Gray Luvisols
2.3.3	Morainal, some organic, glaciolacustrine and glaciofluvial	Undulating, inclined, level, rolling, hummocky, 1 — 9 percent	Orthic Gray Luvisols, Brunisolic Gray Luvisols, some Eluviated Eutric Brunisols, Organic and Gleysolic soils
2.3.4	Morainal, organic	Undulating, level, 1 — 5 percent	Brunisolic Gray Luvisols, Organic soils, Gleyed Brunisolic Gray Luvisols, some Gleysolic soils
2.3.5	Glaciolacustrine veneer and blanket over till, some organic	Undulating, level, 1 — 5 percent	Orthic Gray Luvisols, some Eluviated Eutric Brunisols, Brunisolic Gray Luvisols and their gleyed phases, some Organic and Gleysolic soils
2.3.6	Organic, some morainal, glaciolacustrine and glaciofluvial	Level, undulating, 1 — 5 percent	Organic soils, some Orthic Gray Luvisols, Eluviated Eutric Brunisols and Gleysolic soils
2.3.7	Eolian, organic	Undulating, level, 1 — 5 percent	Eluviated Dystric Brunisols, Organic soils

2.4 Brazeau Plain Subregion

Level to gently sloping plain dissected by the North Saskatchewan and Nordegg rivers. The elevation varies from 800 to 1150 m asl. Surficial materials are mainly glaciolcustrine and include significant areas of organic, minor amounts of eolian, morainal and recent fluvial materials.

2.4.1	Glaciolacustrine, some organic and morainal	Undulating, level, inclined, 1 — 9 percent	Orthic Gray Luvisols, some Organic soils
2.4.2	Glaciolacustrine, organic	Level, undulating, 1 — 5 percent	Gleysolic and Organic soils, some Orthic Gray Luvisols
2.4.3	Morainal	Undulating, 3 — 9 percent	Orthic Gray Luvisols, some Brunisolic Gray Luvisols
2.4.4	Eolian, organic	Undulating, level, ridged, 1 — 9 percent	Eluviated, Dystric Brunisols, Organic soils, some Eluviated Eutric Brunisols
2.4.5	Organic, some glaciolacustrine	Level, 0 — 1 percent	Organic and some Gleysolic soils
2.4.6	Fluvial, some organic	Undulating, level, 1 — 5 percent	Orthic Regosols, Orthic Humic Regosols, some Organic soils

2.5 Crimsom Lake Plain Subregion

Level to gently sloping plain between the elevations of 930 and 1100 m asl. Glaciolacustrine and eolian are the major surficial deposits, but, significant areas of organic, inclusions of morainal and recent fluvial materials are also present.

2.5.1	Glaciolacustrine, organic, some eolian	Level, undulating, 1 — 9 percent	Orthic Gray Luvisols, Brunisolic Gray Luvisols, Organic soils, some Eluviated Eutric and Eluviated Dystric Brunisols
2.5.2	Morainal, some eolian and organic	Level, undulating, inclined, 1 — 9 percent	Eluviated Dystric Brunisols, Brunisolic Gray Luvisols, some Organic soils
2.5.3	Eolian,organic, some glaciofluvial	Level, undulating, ridged, 1 — 9 percent	Eluviated Dystric Brunisols, Organic soils
2.5.4	Eolian veneer and blanket over till, some morainal	Undulating, 3 — 9 percent	Eluviated Dystric Brunisols, some Eluviated Eutric Brunisols
2.5.5	Organic, some eolian	Level, undulating, 1 — 5 percent	Organic soils, some Eluviated Dystric Brunisols
2.5.6	Fluvial, some organic	Undulating, level, 1 — 5 percent	Orthic Regosols, Orthic Humic Regosols, some Organic soils

POOR

QUALITY

ORIGINAL